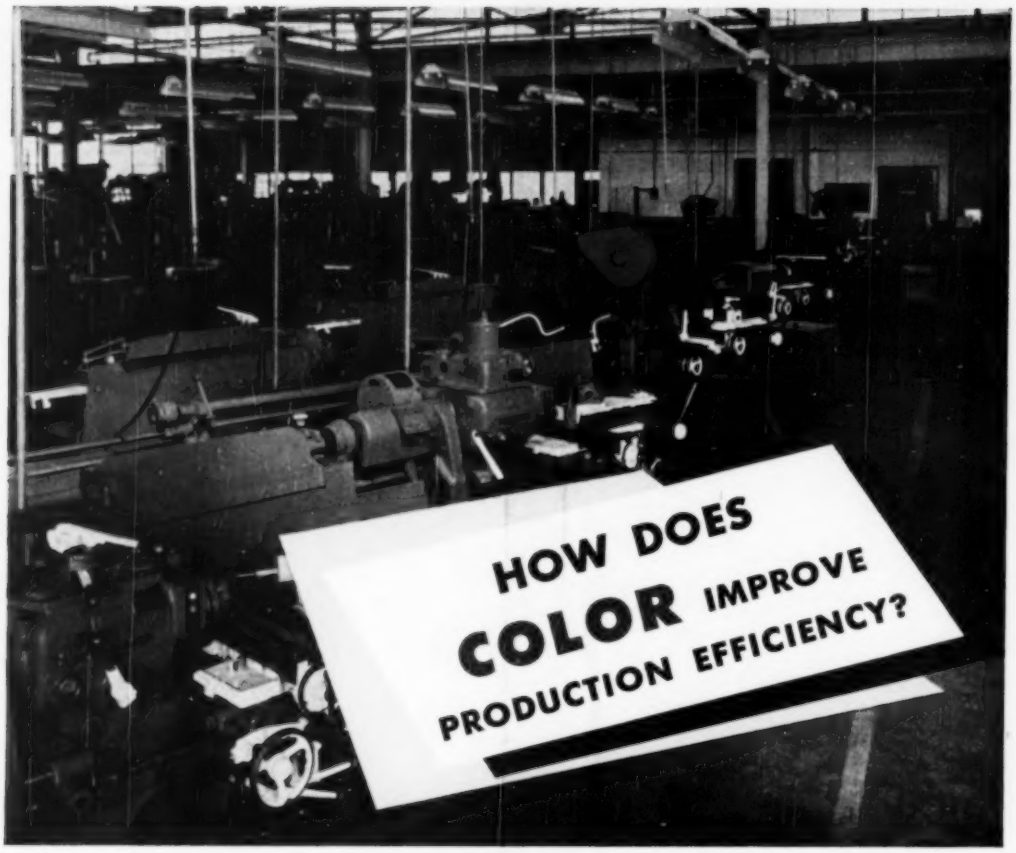
NOVEMBER, 1949 Vol. 38, No. 9

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine



WHAT the skilled shopman of tomorrow knows must extend beyond metals, machines and methods. He will know how to use color properly to improve the quality and quantity of production.

He will know that the use of the right colors on machinery, walls and ceilings can result in *more work per man-hour and more man-hours per man!*

That's why many schools include Pittsburgh's COLOR DYNAMICS in their training courses.

In COLOR DYNAMICS, colors are classified according to their energy. *Focal* colors on machinery assist concentration. *Eye-rest* colors relax the eyes and nervous tension. *Morale-building* colors promote cheerfulness and restrain mental depression. *Safety* colors reduce accident hazards by warning workers of impending dangers.

COLOR DYNAMICS has been applied successfully in many leading plants. It is generally recognized as a distinct advance in production technique.

Begin now to teach COLOR DYNAMICS to your students. Send this coupon today for a free copy of our new edition of *"Color Dynamics in Industry."* Packed with convincing facts and practical suggestions, it is an excellent textbook for manual training and vocational education.

Pittsburgh Plate Glass Co., Paint Div.
Dept. IV-119, Pittsburgh 22, Pa.

Please send me FREE copy of your booklet on COLOR DYNAMICS.

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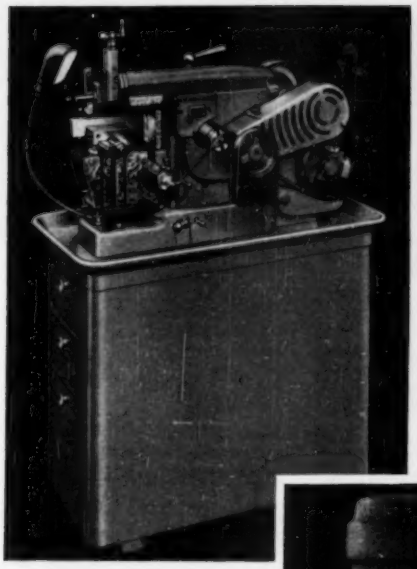
FREE BOOKLET!

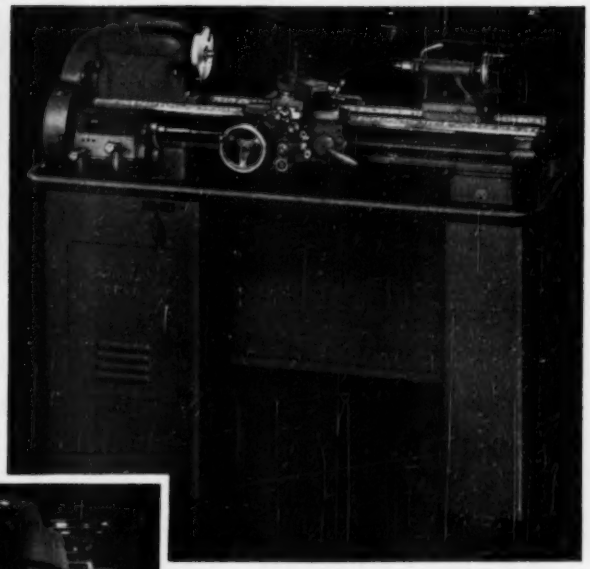
PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

TOP 3 FOR SCHOOL SHOPS





7" Bench Shaper

Price includes vise; light fixture; switches and drive unit with 1/3 h.p., 1 phase, 60 cycle, 115 volt motor. (Steel stand $125 extra.)

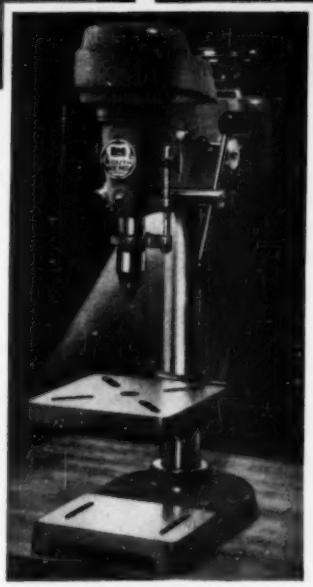
$456.30

14" Drill Press

Bench model (also available in floor model) with drill chuck; built-in light; 1/3 h.p., 1 phase, 60 cycle, 115 volt motor and switch.

$129.30

All prices f. o. b. factory



9" Model A Underneath Motor Driven Lathe

9" x 3-1/2' Model A Lathe with 12-speed underneath drive; 1/2 h.p., 1 phase, 60 cycle, 115 volt motor and switch **$512.45**

These South Bend machine tools make a perfect combination for any school shop. They are ruggedly designed and quality-built throughout for long, dependable service and accuracy. These three South Bend Tools are the basic units required for metal-working courses.

South Bend machine tools are the top buys every time. Students find them exceptionally easy to operate. *Write for literature.*

SOUTH BEND LATHE WORKS

BUILDING BETTER TOOLS SINCE 1906 • 466 EAST MADISON STREET, SOUTH BEND 22, INDIANA

Shown above
The ATKINS
No. 2000

The ATKINS No. 65
20"—10, 11, 12 pt.
24"—8, 9, 10, 11, 12 pt.
26"—7, 8, 9, 10, 11, 12 pt.
5½ pt Rip.

Teach Him The "FEEL" of a GOOD SAW

ATKINS No. 65 "Silver Steel"

Teach him the "feel" of a good saw—and he'll be a better craftsman all his life. He'll learn faster and he'll learn better, because he'll find there's real enjoyment in sawing at its best—with an Atkins No. 65, for instance. Made of famous "Silver Steel," the 65 cuts fast and easily. It bites deep with every stroke, never binds or sticks because it's true taper ground. Its "Perfection" handle prevents wrist strain. And it is a great saw for classroom use because of the way it stands up under the abuse that "green" hands can give a saw... The 65 is just one of the complete line of Atkins Handsaws that speed student learning. Specify Atkins on your next order.

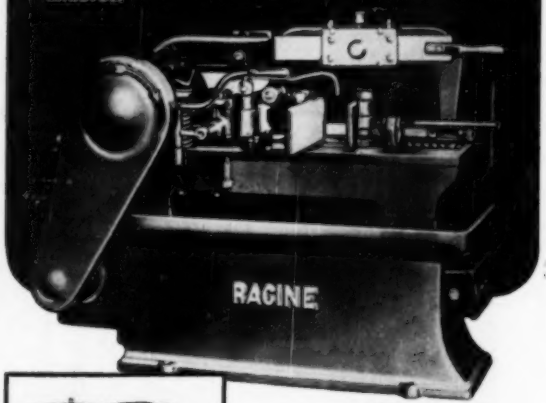
ATKINS

ATKINS

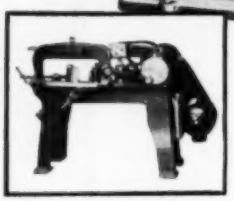
E. C. ATKINS AND COMPANY
Home Office and Factory
402 S. Illinois Street, Indianapolis 9, Indiana
Branch Factory: Portland, Oregon
Branch Offices: Atlanta • Chicago • New Orleans • New York • San Francisco
MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

A RACINE "UTILITY" MAKES METAL CUTTING SIMPLE and EASY

A 15 year old student can learn to efficiently operate a Racine "Utility" in less than 30 minutes.



RACINE "UTILITY"
Wet Cut Model



RACINE "UTILITY"
Dry Cut Model

Racine "Utilities" are used in today's large and small industries as an auxiliary saw for all-around metal cutting work. They are the ideal saws for training students between school and job.

Capacity 6" x 6", these saws will accurately cut any metal from soft aluminum tubing to hard alloy steels. Both the pressure and feed of the saw blade are controlled hydraulically. All moving parts are guarded to prevent accidents — most important in school training equipment.

"Utility" Wet Cut Model is provided with a base containing reservoir for coolant. "Utility" Dry Cut Model is the same as "wet cut" model in every detail except base consists of four sturdy iron legs.

Larger Racine Hydraulic Metal Cutting Saws in capacities of 6" x 6" to 20" x 20" are also available. WRITE for complete metal saw line catalog No. 70-C. Address RACINE TOOL & MACHINE CO., 1780 State St., Racine, Wisconsin.

RACINE

RACINE
TOOL & MACHINE CO.
RACINE, WISCONSIN

STANDARD FOR QUALITY AND PRECISION

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, November, 1949, Volume 38, No. 9. Published monthly, except July and August, by The Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee 1, Wis. Entered as Second-Class Matter January 2, 1914, at the Post Office at Milwaukee 1, Wis., under the act of March 3, 1879. Subscription price in the U. S., Canada, and countries of the Pan-American Union, $3.00 per year; Foreign, $3.50; Single copies, 35 cents.

"NEW" Better-Than-Ever

Atlas DRILL PRESSES

★ NEW 4 Ball Bearing Equipped Head

★ NEW Direct Reading Depth Stop

★ NEW Extra Heavy Construction

★ NEW Operating Smoothness

For Dependable Precision and Longer Service

Good Buys For Your Woodworking Shop

Two basic concepts of tools for instructional use have been met to perfection in the new improved Atlas drill presses.

First, new engineering features provide the ultimate in smooth operation, and enable each student to reach his highest proficiency in precision workmanship. Second, the four ball-bearing-equipped drive, plus new extra heavy construction give you a longer-wearing tool to ease the yearly strain of restricted budgets.

The Atlas drill press has long been noted for the smoothness of its "floating-drive" design. Now it's even better. The steel six-splined spindle is shorter — greatly increasing rigid stability throughout the entire spindle travel. The splined drive sleeve is steel for greater durability. The new direct-reading depth stop gauge has Vernier adjustment. The new box-type head is heavier and more rigid due to the wider spacing of bearings on the column. 15" bench and floor sizes are available in high speed and slo-speed models.

Ask your Atlas dealer for complete details. Send a postcard for latest catalog.

FREE Send a Postcard

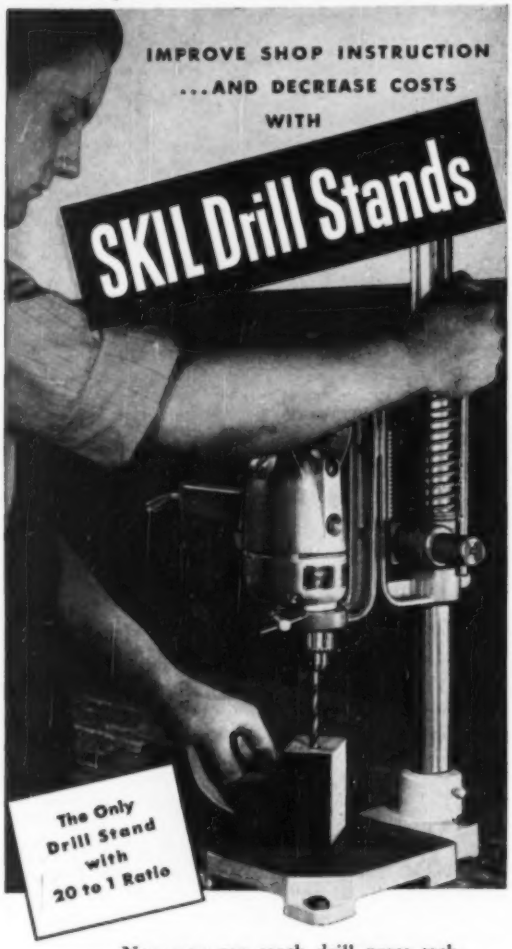
Five useful wall charts for your shop and classroom and new Atlas catalogs of metal and woodworking tools — just mention this advertisement.

ATLAS PRESS COMPANY

1171 N. Pitcher Street, Kalamazoo, Michigan

Atlas POWER KING

MATCHED PRECISION TOOLS FOR WOODWORKING AND METALWORKING



Now you can teach drill press techniques . . . *at portable drill costs* . . . with SKIL Drill Stand. It's a real break for your shop budget!

Combine SKIL Drill with SKIL Drill Stand and you're set for accurate, precision drilling and hole sawing. 20 to 1 leverage ratio makes SKIL Drill Stand ideal for even your youngest students. Base slots hold work firmly. Ground supporting column insures accuracy in any position.

Improve individual shop instruction. Ask your SKIL Tool Distributor to demonstrate SKIL Drill Stand *today!*

SKILSAW, INC.
5033 Elston Ave.,
Chicago 30, Ill.
Factory Branches in Principal Cities
In Canada: SKILTOOLS, LTD.,
66 Portland Street, Toronto, Ont.

SKIL Tools

SKIL Tools are made only by Skilsaw, Inc.

INDIVIDUALLY TESTED
TO INSURE BETTER PERFORMANCE

IMPROVED Spring Clamp
In three convenient sizes

"C" Clamps
Openings 1 in. to 14 in.

Hand Screw
All popular sizes

Quick Clamps
Openings 4 in. to 5 ft.

No. 640 IMPROVED "I" Bar Clamp
Openings 2 ft. to 10 ft.

THERE IS AN INDUSTRIAL DISTRIBUTOR STOCK NEAR YOU

HARGRAVE
CLAMPS

• Hargrave Clamps have been constantly improved with the aid of skilled mechanics to offer greater operating advantages and increased durability. Individually tested, they must be stronger, tougher and flaw-free. Made in openings from ¾ in. to 10 ft., from ½ in. to 16 in. deep.

WRITE FOR CATALOG showing the complete line of Hargrave Individually Tested Clamps, Chisels, Punches, Brace Wrenches, Star Drills, Washer Cutters, File Cleaners, etc.

Waverly & Main Aves.
Cincinnati 12, Ohio

HARGRAVE Tested Tools
THE CINCINNATI TOOL COMPANY

ARMSTRONG
Drop Forged
LATHE DOGS

ARMSTRONG Lathe Dogs give extra service because they are drop forged from selected open hearth steel, and, are heat treated to extreme toughness and stiffness. Hubs are made large enough to permit re-tapping, screws are also of special analysis steel and are hardened at the point to prevent upsetting. ARMSTRONG Dogs come in 10 types with square head or safety headless screws, with straight or bent tails. They are carried in stock by your local ARMSTRONG Distributor.

Write for New S-48 Catalog, just released.

ARMSTRONG BROS. TOOL CO.
5222 West Armstrong Ave.
Chicago 30, U.S.A.
New York and San Francisco

NEW

11-inch SWING

Logan LATHES

FOR THE SCHOOL SHOP

Designed and built for industrial use, these 11" Logan Lathes equip the school shop for a wide range of projects that keep student interest at a high level and provide a broad and thorough training.

They Have CAPACITY...

1" collet capacity, 1⅜" spindle hole, and center distances of 24" and 36" are indicative of the capacity for larger work these 11" swing lathes offer.

They're ACCURATE...

Precision preloaded ball bearing mounting assures sustained accuracy at any spindle speed from 45 to 1500 rpm. The two V-ways and two flat ways of their rugged beds are precision ground to a tolerance of .0005" along the lineal capacity of the lathe.

They're SAFE...

To protect inexperienced student operators, the countershaft, back gears, headstock, change gears and motor drive belts of these 11" lathes are all completely enclosed, yet easily accessible.

They're DURABLE...

Self-lubricating bronze bearings protect against wear at points where bearings are not ordinarily used. The lathes are ruggedly built throughout to withstand the stresses of school shop use with a minimum of maintenance.

They're A SOUND INVESTMENT...

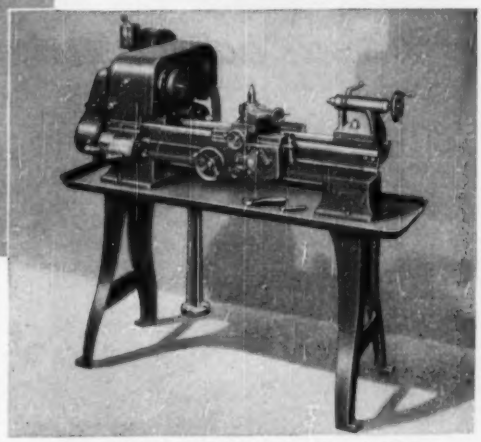
We know of no other lathe which offers the student and the school so much in accuracy and versatility for the price that Logan production efficiency makes possible.

WRITE FOR DETAILED INFORMATION ON ALL LOGAN 9", 10", and 11" LATHES AND 8" SHAPERS

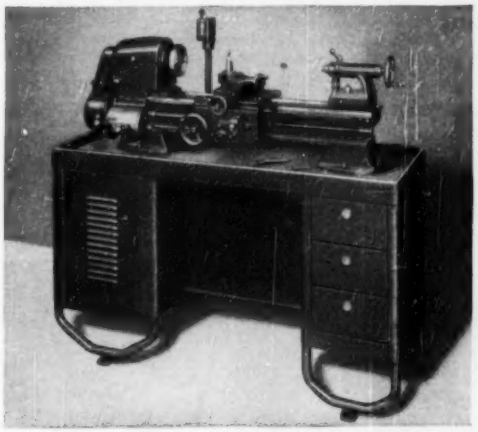
LOGAN ENGINEERING COMPANY

4901 WEST LAWRENCE AVENUE • CHICAGO 30, ILLINOIS

Available in Bench, Floor, Cabinet and Turret Models



Logan 11" Floor Lathe. Quick Change Gears, 1" Collet Capacity, 1⅜" Spindle Hole, 24" and 36" Between Centers



Logan 11" Cabinet Lathe. Quick Change Gears, 1" Collet Capacity, 1⅜" Spindle Hole, 24" and 36" Between Centers

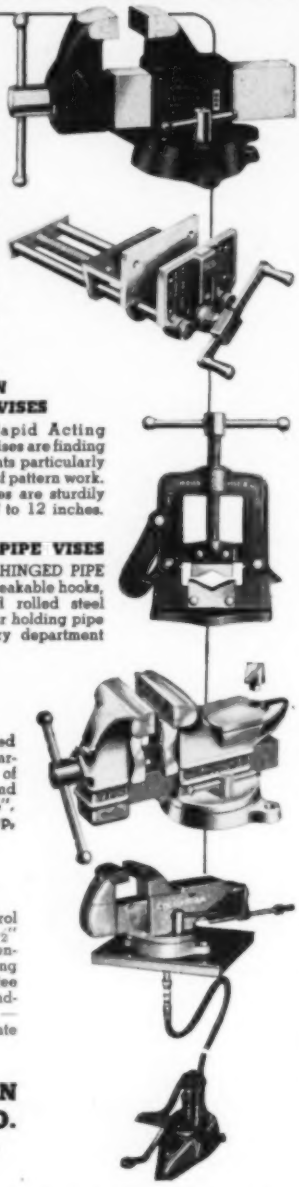
LOGAN 8" SHAPER

Combines extra capacity, wide speed range, smooth power and simple, low cost operation.

LOOK TO Logan FOR *BETTER* LATHES AND SHAPERS

COLUMBIAN VISES

for many varied uses



COLUMBIAN MACHINISTS' VISES

Columbian Malleable Iron MACHINISTS' VISES are guaranteed unbreakable! In addition to their exceptional strength, Columbian engineering has built into these vises the finest mechanical perfection and special features appreciated by users. Made in all standard sizes — 3" to 8" jaw widths equipped with replaceable tool steel jaw faces. Available also in adjustable jaw and combination pipe vise types.

COLUMBIAN WOODWORKERS' VISES

Continuous Screw & Rapid Acting Columbian Woodworkers' Vises are finding increased uses in many plants particularly for the more ordinary types of pattern work. These durable low cost vises are sturdily built with jaw openings up to 12 inches.

COLUMBIAN HINGED PIPE VISES

Columbian Malleable Iron HINGED PIPE Vises have self locking unbreakable hooks, tool steel pipe jaws, cold rolled steel screws and handles. Sizes for holding pipe from ¼" up to 12". Every department should have one.

COLUMBIAN HOMESHOP VISES

Sturdily designed, balanced strength and attractive appearance. A complete range of sizes, jaw widths 3", 3½" and 4"; jaw openings 3½", 4", 4½", for home workshop, garage and general use.

COLUMBIAN HYDRAULIC VISE

Simple, two pedal foot control leaves both hands free. 3½" jaw widths and 6" jaw openings. Precision manufacturing and tested quality guarantee positive operation and dependable power. Saves time — speeds production — accurate work position.

THE COLUMBIAN VISE & MFG. CO.
9022 Bessemer Avenue
Cleveland 4, Ohio

THE WORLD'S LARGEST MAKERS OF VISES

MORE POWERFUL STANLEY-CARTER RS8 ROUTER-SHAPER

More power, mechanical improvements, versatility, ease of handling . . . more of everything for your money in this latest addition to the Stanley-Carter line.

MORE POWER New ½ h.p., heavy-duty motor, wound and insulated to withstand severe mechanical shock and vibration. Operates on D.C. or A.C., 60 cycles or less.

MECHANICAL IMPROVEMENTS Separate, dust-tight housing for switch connections. New ventilating system provides powerful air blast to cool motor and keep work surface clean. Air is taken in below brushes and connections so that dirt is kept away from these parts. Oversize ball bearings, sealed and lubricated for life. No oiling. Brush caps protected by cast rim.

PLUS OTHER POPULAR STANLEY-CARTER FEATURES Simple, accurate depth of cut adjustment just by turning accurately threaded motor casing. Recessed switch to prevent accidental flipping of switch. Non-slipping, carefully ground collet type chuck. Write for literature. Stanley Electric Tools, Stanley-Carter Sales Dept., 536 Myrtle St., New Britain, Connecticut.

STANLEY
Reg. U. S. Pat. Off.

HARDWARE • HAND TOOLS • ELECTRIC TOOLS • STEEL STRAPPING

Snap-on Tools

Industry's Standard for Production and Maintenance

...helps train students to work as skilled mechanics

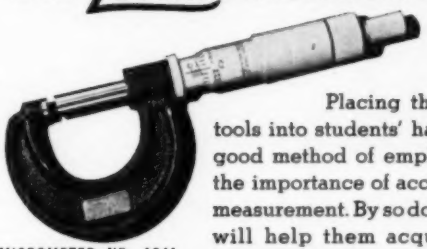
When students know they are working with tools that are the accepted standard throughout industry, there is a definite improvement in the quality of work they do. As a result, they have increased confidence in their ability to turn out a good job because of the new speed and dexterity at their command. They know "quality tools" help turn out a "quality job".

Snap-on, located in principal cities from coast to coast, offers you the services and counsel of tool experts. Write for the address of your nearest Snap-on branch . . . and the new complete catalog of 4,000 Snap-on tools.

SNAP-ON TOOLS CORPORATION
8074-K 28th Avenue, Kenosha, Wisconsin

ED-1

Stress the importance of TRUTH IN DIMENSIONS with LUFKIN Precision Tools



Placing these fine tools into students' hands is a good method of emphasizing the importance of accuracy of measurement. By so doing, you will help them acquire the same confidence which the name "Lufkin" has inspired in the minds of skilled craftsmen for more than sixty-five years. Write for free catalog.

MICROMETER NO. 1941
Heavy, enameled, ribbed frame micrometer especially designed for students' use. Rust resistant "CHROME CLAD" non-glare satin finish on hub and spindle makes markings stand out in bright or poor light.

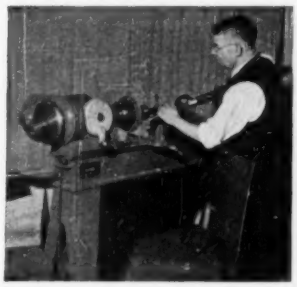
THE AMAZING STORY OF MEASUREMENT

★ SEND FOR THIS BOOKLET!
Send for this interesting and educational 5-color picture story book. Enclose 10c to cover handling and mailing costs. Write Dept. AE.

THE LUFKIN RULE COMPANY
PRECISION TOOLS · TAPES · RULES
Saginaw, Michigan

Teach Metal Spinning

correctly on this new "Oliver" Metal Spinning Lathe for school shops

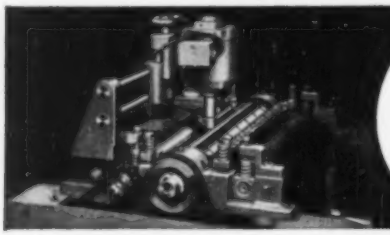


You and your students can execute beautiful, useful projects too, with the "Oliver" Metal Spinning Lathe. You'll find it the most popular and most valuable machine in your shop.

Students learn quickly to spin practical articles of surprising beauty from pewter, copper, aluminum, bronze, etc. Its smooth flow of power spins 20-gauge steel with ease. Has heavy bed, extra large bearings, live tail center. Ball bearing motor driven headstock adjustable from 800 to 2750 r.p.m. And for turning wood this "Oliver" Lathe is unmatched.

WRITE FOR FOLDER 159M

OLIVER MACHINERY COMPANY, GRAND RAPIDS 2, MICH.



FOR TEACHING
Standard Planing Practice
HERE IS, by long odds, your Best Bet!

BUSS NO. 208 WOOD PLANER

CAPACITY 20" x 8"

It is the only planer in the low-cost field that is adjusted and operated similarly to the large standard machines used in industry . . . the only planer in this class that is equipped with a sectional infeed roll, sectional Chipbreaker, four driven rolls, in-built knife grinder and other big planer features. The grinder permits the instructor to grind the knives in just a few minutes. It saves a great deal of his time and tends to eliminate the dull knife condition which so frequently prevents the student from doing good work. Engineered for maximum protection, the No. 208, judged from any angle, is the best possible selection for teaching standard wood planing practice in the school shop. And the price is well within the means of the average school budget. Write for the complete facts.

BUSS MACHINE WORKS
246 Eighth St., HOLLAND, MICHIGAN

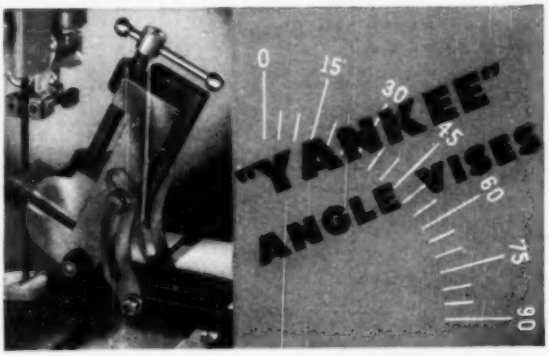
TAKE A GOOD LOOK
at this Sjöström Shop Bench

There's only one practical way we know to let you see for yourself just how attractive, finely finished and well constructed these Sjöström Shop Benches are and that is to send you an *actual, unretouched photo* along with information on sizes, specifications and prices.

Therefore, if you will send us your name and address (a post card will do) we will send you your photo. We *know* you'll agree that these benches are *ideal* for school shops where long life and utility are important.

Sjöström Shop Benches are made in single or double types.

JOHN E. SJÖSTRÖM COMPANY
1712 N. Tenth Street, Philadelphia 22, Penna.



One indispensable tool that multiplies the value of every machine tool in your shop

Angle set-ups for your drill press, shaper, saw and other machines . . . and for bench work . . . without special jigs or fixtures. Simple 1-minute, 2-step operation. Lock the work in a "Yankee" Angle Vise. Adjust for the angle and engage positive adjustment lock. Angle adjustment does not interfere with full capacity of jaw opening. You're set up for every stage of the job, from bench to machine and back to bench. Attaches quickly to swivel base on bench or to table of any machine. Two sizes, 2" and 2¾" jaws, with or without swivel base. Write for Vise Folder and "Yankee" Tool Book.

YANKEE TOOLS NOW PART OF STANLEY THE TOOL BOX OF THE WORLD

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

Jointer
Model P912

Patented Walker-Turner Dual Purpose Guard permits planing stock to uniform ribbon thinness with absolute safety.

YOU CAN'T TOUCH THE KNIVES ON THIS 6 INCH JOINTER

Only Walker-Turner can offer a 6" Jointer equipped with the patented Dual Purpose Guard. This unusual guard completely covers the knives at all times, making it impossible for the operator to come in contact with the blades. In addition, the guard is adjustable and can be used with any width of stock up to the capacity of the machine.

Extra long tables—37½ inches; machined dove-tailed ways for lasting accuracy; solid steel, ground and dynamically balanced, three knife cutterhead are some of the many features which make this jointer outstanding.

Variable Speed Lathe Model L1152

EXTRA CAPACITY VARIABLE SPEED LATHE

Because the gap bed construction has been carefully planned, you get an extra capacity of 3½ inches—and at no sacrifice of sturdiness or convenience. Swing over gap is 15½ inches; over bed is 12 inches. The distance between centers is 38 inches; from bed to floor, 36 inches.

The variable speed drive is built as an integral part of the headstock, and provides any speed from 260 rpm to 1200 rpm, and it can be locked at any desired speed.

The headstock has two sets of pre-loaded precision ball bearings with deep groove races. Headstock spindle, which is hollow, is one inch in diameter between bearings. The spindle is threaded for outboard mounting of face plate.

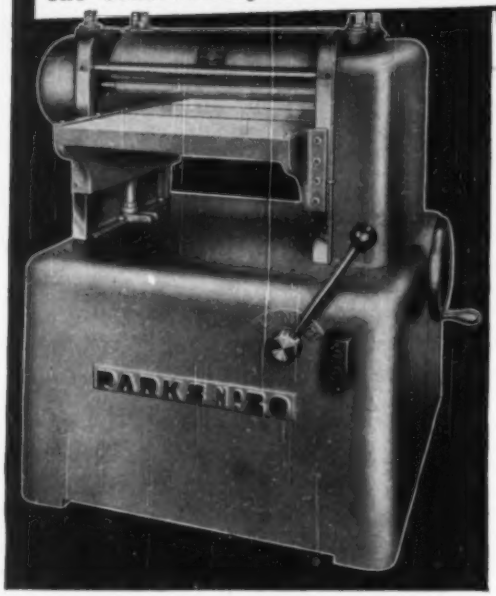
Tailstock bed ways are machined on top, sides and bottom left for accuracy and ease of operation. The tailstock center is automatically ejected.

Speed Control and Locking Device

walker-turner

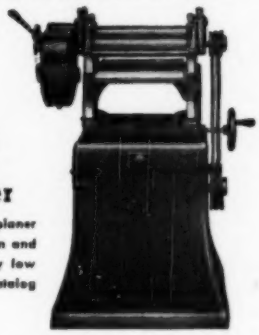
WALKER-TURNER DIVISION
KEARNEY & TRECKER CORPORATION
PLAINFIELD, NEW JERSEY

The Sensationally NEW Low-Priced



PARKS No. 20
20" PLANER

Here is a modernly designed, rugged, high-speed, low-priced planer that is ideally suited for every shop and industrial plant requiring a quality surfacer. The Parks No. 20 Planer has a four-knife cutterhead with a speed of 3600 R.P.M. and offers two feed speeds — 20 and 40 F.P.M., and 40 and 80 F.P.M. Write for complete descriptive literature.



The PARKS Heavy-Duty 12" x 4" Planer

A compact, sturdy, thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive catalog sheet.

The PARKS WOODWORKING MACHINE CO., Dept. 22-HH, 1546 Knowlton St., Cincinnati 23, O.

Specify * WALLACE on your new school-shop equipment

*WALLACE No. 28 SHAPER
2 H.P.—10,000 rpm—no belts.

Be Dollar-Wise!

SAVE MONEY WHEN YOU SPEND MONEY

It is being done right along! . . . by schools whose limited budgets must get the most return in longer service and better performance.

If you ARE interested in buying Bonus-Values — *specify* Wallace!

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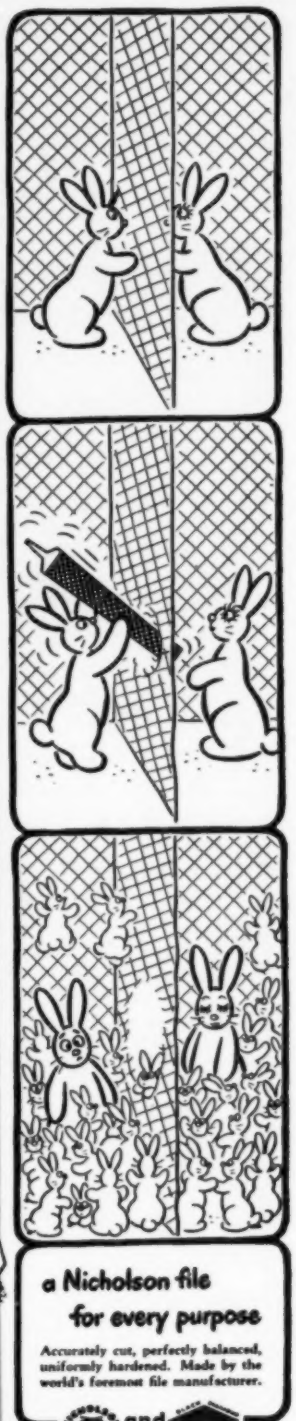

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Conventions

The list of conventions shown below presents strong evidence that industrial arts and vocational education teachers know the value of group conferences. Look this list over carefully. Join your community, regional, state, and national teachers' associations, and do your share in helping your profession now.

This Month's Cover

Our cover this month shows a machine-shop student setting up a job on an angle plate, using a surface gauge.

The photograph was submitted by Thurston M. Rothrock, machine-shop instructor, High School, St. Charles, Mo.

Coming Conventions

Oct. 20–21. Minnesota Vocational Association, at Minneapolis, Minn. Headquarters, Radisson Hotel. Convention chairman, Clarence Funk, Vocational Division, Shubert Bldg., St. Paul, Minn.

Oct. 20–21. Minnesota Trade and Industrial Education Association, at Minneapolis, Minn., held in connection with the Minnesota Vocational Association Convention.

Oct. 21. Industrial Education Section, Maryland State Teachers Association, at Baltimore, Md. Headquarters, Broadway Junior High School. Chairman, Arthur A. Dick, Industrial Education Section, Board of Education of Baltimore County, Towson 4, Md.

Oct. 21. North Dakota Vocational Association, at Minot, N. Dak. Secretary, Shubel D. Owen, North Dakota Agricultural College, State College Station, Fargo, N. Dak.

Oct. 21–22. Four-State Regional Conference on Industrial Education, at Pittsburg, Kans. Headquarters, Kansas State Teachers College. General chairman, Dr. J. V. Melton, Pittsburg, Kans.

Oct. 21–22. Pacific Arts Association, at Portland, Ore. Headquarters, Multnomah Hotel. Convention chairman, Ruth Halvorson, 641 N.E. Clackamas St., Portland, Ore.

Oct. 24–27. Department of Adult Education of the National Education Association of the U. S., at Cleveland, Ohio. Headquarters, Allerton Hotel. Executive secretary, Leland P. Bradford, 1201 Sixteenth St., N.W., Washington 6, D. C.

Oct. 24–28. National Safety Council, at Chicago, Ill. Headquarters, Stevens Hotel. Convention chairman, R. L. Forney, 20 N. Wacker Drive, Chicago 6, Ill.

Oct. 26–29. Maryland Vocational Association, at Baltimore, Md. Headquarters, Lord Baltimore Hotel. Secretary, Kenneth G. Horvath, School No. 297, Baltimore 31, Md.

Oct. 27. Indiana Vocational Association, at Indianapolis, Ind. Secretary, Glen Barkes, 802 E. Market St., New Albany, Ind.

Oct. 27–28. Nebraska Vocational Association, at Lincoln, Neb. Headquarters, University of Nebraska. Convention chairman, E. H. Parrish, Public Schools, Omaha, Neb.

Oct. 27–29. Maine Association for Industrial Education, at Bangor, Me. Headquarters, Bangor High School. President, John Greer, Cony High School, Augusta, Me.

Nov. 3. Iowa Vocational Association, at Des Moines, Iowa. Headquarters, Hotel Savery. Secretary, Mark Z. Hendren, State House, Des Moines, Iowa.

Nov. 3–4. Kansas Industrial Education Association, at Wichita, Kans. Chairman, L. M. Nuzman, 1210 Grand, Topeka, Kans.

Nov. 3–4. Kansas Vocational Association, at Wichita, Kans. Headquarters, Allis Hotel. Convention chairman, W. F. Currier, Coffeyville, Kans.

Nov. 3–5. Iowa Industrial Education Association, at Des Moines, Iowa. Headquarters, Iowa Industrial Education Association Shops Bldg. Convention chairman, Don Foster, Shops Bldg., 8th and Walnut St., Des Moines, Iowa.

Nov. 4. Missouri Industrial Education Association, at St. Louis, Mo. Headquarters, Municipal Auditorium. Secretary, George E. Kohrman, State Department of Education, Jefferson City, Mo.

Nov. 4. Virginia Vocational Association, at Richmond, Va. Headquarters, John Marshall Hotel. Convention chairman, Robert F. Williams, 401 North Ninth St., Richmond 19, Va.

Nov. 4–5. New England Industrial Arts Teachers Association, at Providence, R. I. Headquarters, Crown Hotel and Rhode Island College of Education. Chairman, Arthur L. Geraghty, 284 Norfolk Ave., Pawtucket, R. I.

Nov. 4–5. Wisconsin Industrial Arts Association, at Milwaukee, Wis. Headquarters, Hotel Schroeder. Convention chairman, Reuben A. Charette, 1925 North 49th St., Milwaukee, Wis.

Nov. 5–6. Association of Trade and Technical Administrators of New York State, meeting at Syracuse, N. Y. Headquarters, Syracuse Hotel. Secretary, Dr. Nelson J. Murbach, Board of Education, 255 W. Main St., Batavia, N. Y.

Dec. 5–6. National Association of State Directors of Vocational Education, at Atlantic City, N. J. Headquarters, Hotel Traymore. Convention chairman, J. B. Perky, A. & M. College, Stillwater, Okla.

Dec. 5–10. National Council of Local Administrators of Vocational Education and Practical Arts, in conjunction with the American Vocational Association, at Atlantic City, N. J. Headquarters, Hotel Traymore. Secretary, Dr. Albert E. Jochen, Middlesex County Vocational Schools, Easton Ave., New Brunswick, N. J.

Dec. 6. Business meeting of the American Association of Technical High Schools and Institutes, at Atlantic City, N. J., in connection with American Vocational Association convention. President, Walter J. E. Schiebel, principal, N. R. Crozier Technical High School, Dallas, Tex.

Dec. 6–10. American Vocational Association, at Atlantic City, N. J. Executive secretary, L. H. Dennis, 1010 Vermont Ave. N.W., Washington 5, D. C.

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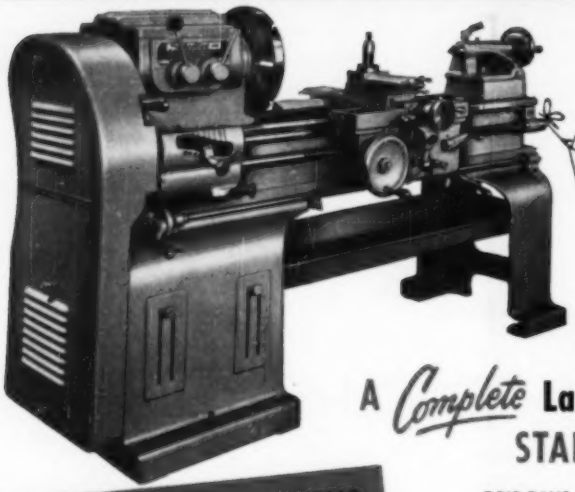

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-IAVE-
NOVEMBER . . 1949

The Analysis Technique*

WILLIAM J. MICHEELS
Associate Professor of Industrial Education
University of Minnesota
Minneapolis, Minn.

One of the most important factors in the development of a successful training program is the determining of *what to teach.* This is especially true for those persons who know their trade well, but think they can take a green worker into the shop and teach him in a hit-or-miss manner without much planning. That would be like the merchant who tries to remember everything he has bought and sold during the year and then makes a guess at what his income tax should be. Such a procedure doesn't pay out — for long. And that's true in both cases.

The merchant who has something to sell takes an inventory of the stock he has to sell and doesn't trust his memory. The competent trainer also makes an inventory of what he has to teach and doesn't trust his memory to get him by. He makes an instructional analysis. This gives him a clear picture of the things to be taught. It also helps in keeping track of what has been accomplished and what remains to be done. One big reason why excellent mechanics sometimes make poor instructors is that they forget they too were once beginners. The beginner has to learn the little things that the experienced worker does merely through habit. When it comes time to teach, the skilled worker skips over and forgets to teach many of these litttle things — unless he has an analysis that serves as a check list of everything that must be taught. It's only businesslike as well as common sense to know ahead of time what has to be taught.

*This brief description of the analysis technique has been taken almost verbatim from promotional materials prepared by the writer for employers in the transportation industry. Vocational educators will still find it useful for such a purpose. It will also serve as a simple overview for instructors or students who are beginning a study of analysis techniques.

Of What Does an Instructional Analysis Consist?

It has already been said that it is similar to an inventory. In one sense, it's simpler than an inventory because there are really only two headings under which the listings occur:

1. What the worker must be able to do (doing units).
2. What the worker must know (knowing units).

In other words, when you make an analysis you list the operations that are performed in the work and also the information that has to be learned.

What Is a Doing Unit?

A doing unit is an operation. It is usually manipulative in nature. It stands by itself. That is, it is more than a step in another operation. It is not too large. It can be demonstrated. It can be taught. A simple general rule in identifying an operation is to start out with the words "how to." For example: "How to" time an engine. "How to" check a boiler. "How to" lock a box car. "How to" double-clutch an engine. "How to" throw a switch. "How to" measure with a micrometer.

Thus, doing units (operations) encompass the various skills that must be learned in order that the job can be performed satisfactorily.

What Is Information?

The information we're thinking of here is sometimes called the "knowing units" of instruction. Of course, certain information is imparted when you teach an operation, but we're thinking of those things the worker must know in addition to the manipulative work: basic theories, safety rules, principles, characteristics, etc. By knowing this information he is better able to form judgments and make decisions in performing the operations. For example: Kinds and types of carburetors. Safety rules. Equipment and controls of various streetcars. Records and reports. The Diesel engine. Principles of transforming water into steam. Principles of lubrication.

These samples of typical information (knowing) units will usually be taught in the classroom where charts, samples, motion pictures, and other visual aids can be used to get the instruction across.

What Else Remains to Be Done?

After you have selected the *doing units* and *knowing units* that could be taught or should be taught, one important step remains. Each of these units of instruction is broken down to serve as a guide for the instructor. This is done by going over the *operation* and listing the exact steps to go through in performing it. For a *knowing unit* the breakdown will consist of an outline of the information that is to be covered. As an example of the breakdown of a doing unit let's take an operation from automotive maintenance:

(How to) Remove, Install, and Adjust Fan Belt

Tools, equipment, and materials:

1. Wrench, box end, ½ x 9/16 in.
2. Fan belt.

Instructional steps:

1. Remove studs from generator brace.
2. Push generator toward engine.
3. Remove fan belt from generator pulley.
4. Drop fan belt so it will clear crankshaft pulley.
5. Raise belt, turn fan by hand, work belt off fan.
6. Install new belt, working it over fan blades into water pump pulley.
7. Work belt over crankshaft pulley, generator pulley.
8. Install stud in generator brace.
9. Adjust fan belt — usually ¾ to 1-in. slack on longest span (see *Manufacturer's Manual*).
10. Tighten generator brace stud.

With a breakdown of the operating steps like this the guesswork is taken out of the instruction and the teacher is sure to teach every point that should be included whether large or small. He does not trust to memory alone.

For a knowing unit the breakdown would consist of a brief outline of the main points that should be explained to the trainee. As an example we'll take another unit from the cooling system:

Purpose and Types of Thermostats

Instructional steps:

1. Purpose of thermostat — control water temperature
2. Types of thermostats
   a) Bellows
   b) Bimetal
3. Advantanges
   a) Bellows more accurate
   b) Bimetal cheaper, lasts longer
4. Disadvantages
   a) Bellows expensive, more fragile
   b) Bimetal less accurate
5. Engine temperatures — from 140 to 180, not over nor under
6. Under cooling engine — burns oil seal from engine parts, speeds wear
7. Over cooling engine — condensed fumes in crankcase speeds formation of sludge, oxidizes metal parts inside engine
8. Testing thermostats
9. Two-in-one water line.

The details are missing from the above outline, but the competent instructor knows them. What he needs is a reminder of the main things to be explained and he can provide the necessary details. Unless an outline such as this is available, the instructor cannot expect to remember every important bit of information that should be taught to a new worker.

Let's Draw a Simple Picture of What We've Been Saying

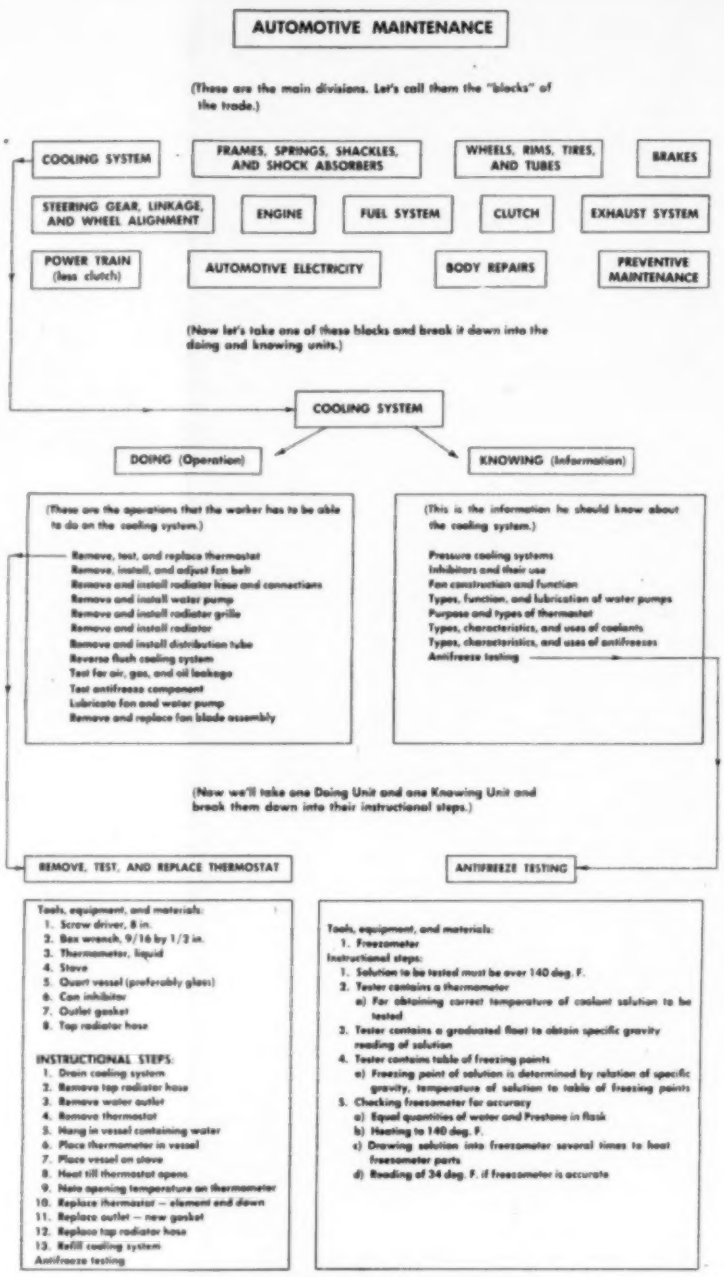
Since all of us are somewhat acquainted with the job of an automotive maintenance worker, let's continue in that field (remembering that the technical details should be worked out finally by a person thoroughly competent in that field).

When the instructional units for each *block* have been identified and broken down, the instructor will have a complete inventory of the skills and information that the new worker must learn. With these on file for ready reference, a good share of the guesswork is taken away from the job of breaking in new men. Whether you have one person or several, old workers or new, an instructional analysis will save time and add to the effectiveness of the breaking in process.

Who Should Make Such an Analysis?

First of all, it was not intended that this short description would tell the beginner all there is to know about the analysis technique.[1] It was intended merely, to show what such an analysis consists of and to impress upon the beginning instructor, the logic, as well as the importance, of making an analysis of every job for which he must train workers.

[1]For a detailed and thorough description of the technique, see V. C. Fryklund's *Trade and Job Analysis*, Bruce Publishing Co.


AUTOMOTIVE MAINTENANCE
(These are the main divisions. Let's call them the "blocks" of the trade.)
COOLING SYSTEM
FRAMES, SPRINGS, SHACKLES, AND SHOCK ABSORBERS
WHEELS, RIMS, TIRES, AND TUBES
BRAKES
STEERING GEAR, LINKAGE, AND WHEEL ALIGNMENT
ENGINE
FUEL SYSTEM
CLUTCH
EXHAUST SYSTEM
POWER TRAIN (less clutch)
AUTOMOTIVE ELECTRICITY
BODY REPAIRS
PREVENTIVE MAINTENANCE
(Now let's take one of these blocks and break it down into the doing and knowing units.)
COOLING SYSTEM
DOING (Operation)
KNOWING (Information)
(These are the operations that the worker has to be able to do on the cooling system.)
Remove, test, and replace thermostat
Remove, install, and adjust fan belt
Remove and install radiator hose and connections
Remove and install water pump
Remove and install radiator grille
Remove and install radiator
Remove and install distribution tube
Reverse flush cooling system
Test for air, gas, and oil leakage
Test antifreeze component
Lubricate fan and water pump
Remove and replace fan blade assembly
(This is the information he should know about the cooling system.)
Pressure cooling systems
Inhibitors and their use
Fan construction and function
Types, function, and lubrication of water pumps
Purpose and types of thermostat
Types, characteristics, and uses of coolants
Types, characteristics, and uses of antifreezes
Antifreeze testing
(Now we'll take one Doing Unit and one Knowing Unit and break them down into their instructional steps.)
REMOVE, TEST, AND REPLACE THERMOSTAT
ANTIFREEZE TESTING
Tools, equipment, and materials:
1. Screw driver, 8 in.
2. Box wrench, 9/16 by 1/2 in.
3. Thermometer, liquid
4. Stove
5. Quart vessel (preferably glass)
6. Can inhibitor
7. Outlet gasket
8. Top radiator hose
INSTRUCTIONAL STEPS:
1. Drain cooling system
2. Remove top radiator hose
3. Remove water outlet
4. Remove thermostat
5. Hang in vessel containing water
6. Place thermometer in vessel
7. Place vessel on stove
8. Heat till thermostat opens
9. Note opening temperature on thermometer
10. Replace thermostat — element end down
11. Replace outlet — new gasket
12. Replace top radiator hose
13. Refill cooling system
Antifreeze testing
Tools, equipment, and materials:
1. Freezometer
Instructional steps:
1. Solution to be tested must be over 140 deg. F.
2. Tester contains a thermometer
   a) For obtaining correct temperature of coolant solution to be tested
3. Tester contains a graduated float to obtain specific gravity reading of solution
4. Tester contains table of freezing points
   a) Freezing point of solution is determined by relation of specific gravity, temperature of solution to table of freezing points
5. Checking freezometer for accuracy
   a) Equal quantities of water and Prestone in flask
   b) Heating to 140 deg. F.
   c) Drawing solution into freezometer several times to heat freezometer parts
   d) Reading of 34 deg. F. if freezometer is accurate

Analysis of automotive maintenance course

As far as assistance in making an analysis is concerned, we refer you again to the training man in your community. He's as close as your vocational school.

You know your trade. The training man knows his trade. By contacting him and working together you can work out a program that will add to the effectiveness and efficiency of your operations now and in the future.

Plastics in the Industrial-Arts Shop

DONALD B. GREENWOOD
State Supervisor, Industrial Arts
Salt Lake City, Utah

(Continued from page 317 of the October, 1949, issue)

Classification of Plastics

Plastics, broadly defined, means "any material which can be formed or molded." Under this definition, plastics, as such, are not new and if one refers to biblical history it will be found that the mother of Moses lined his basket with plastic, for we read that in order to waterproof the basket she spread pitch over the inside of the basket in which she set Moses afloat. Another plastic which has been used for centuries is shellac which is a resinous gum produced from the secretion of an oriental insect called the *Lac* bug. This shellac was used by the early orientals for many different purposes, and has been greatly valued by them in their economic history. It is also interesting to note that if the broad definition of plastics is accepted, there are some plastics, so called, which are really not plastics since they are not capable of being further formed or molded after their manufacture is complete.

Plastics are divided into two general groups: (*a*) the natural resins, and (*b*) the synthetic resinoids. These general groups each include some plastics which are thermosetting and others that are thermoplastic as shown in the following tabulation:

Natural Resins (Those found in nature)

Thermoplastic

Rubber
Tar and asphalt
Shellac
Waxes and paraffin
Glue
Amber

Thermosetting

Gelatine
Casein

We are all fairly well acquainted with these *natural* resins.

Synthetic Resinoids (Those which are manufactured)

Thermoplastic
Acrylics (Plexiglas, Lucite)
Cellulose acetate (Lumarith, Tenite I, Plastacele)
Cellulose nitrate (Celluloid, Nitron, Pyralin)
Styrenes (Lustron, Styron, etc.)
Vinyls (Vinylite, Koroseal, Korogel)

Thermosetting
Phenol-formaldehyde (Bakelite, Catalin, Marblette, Durez, etc.)
Phenol-furfural (Durite)
Urea-formaldehyde (Bakelite, Beetle, Plaskon, etc.)

In order to avoid confusion of terms, the word *resins* is reserved for the natural plastics. The term *resinoids* is a word coined to designate the synthetic plastics, or those that are made by man. Thermoplastic materials are those which return to the original liquid or semiliquid state upon the application of heat. Thermosetting plastics undergo a change through the addition of catalysts and application of heat, which causes the plastic to harden permanently.

As has already been stated, the varieties of plastics are many, and according to the tabulation above there are 18 or more different general classifications. This number is increased because there are many different types of phenol-formaldehyde plastics, for example, which are manufactured under different trade names and which have certain different physical and chemical properties. Again there are various types of vinyl plastics which are manufactured under the trade names Vinylite, Koroseal, Korolac, and Korogel, etc. The great family of plastics is used in thousands of ways, one of the most popular of which at the present time is the use of the plastic nylon in hosiery and other textiles. Nylon produces filaments of superior quality to serve as bristles in toothbrushes, hairbrushes, and paint brushes, and as wide a range of uses can be found for practically all of the plastics as can be outlined for the nylon plastic.

The manufacture of synthetic resinoids (the *man-made* plastics), requires too great an outlay of money for special equipment and facilities, to make possible the small scale production which is found in some other lines of industry. For this reason, stock sizes and shapes are manufactured by the larger companies. Many of these stock sizes and shapes are suitable for craft work and other industrial applications. The cost of casting special orders unless such orders are very large is prohibitive — therefore the school shop and craftsmen generally must use the sizes and shapes which are currently available. Phenol-formaldehyde plastics, for example (Catalin, Marblette, etc.) are available in many sizes and shapes, such as hearts, scotty dogs, elephants, rabbits, crosses, and others which may be used in the making of pins and dress clips and other small decorative projects. This material is also available in sheets of varying thicknesses; square, round, and octagonal rods, cylinders, and tubes, and in various other shapes. These phenol-formaldehyde shapes are cast in thin lead molds which have been formed by dipping cold steel arbors or patterns into molten lead. Enough of the hot lead solidifies on the cold steel to produce a hollow lead mold when the steel core is withdrawn. Into these lead molds, which have a one-way taper, the *A* stage resinoid is poured. The *A* stage mixture is a clear syruplike liquid which has been cooked for about 18 hours. If a solid color is desired, the coloring may be added in the cookers. Mottled colors are stirred in at the instant of pouring. The filled molds are placed in ovens to bake or cure at a temperature of about 200 degrees for several days — after which the molds are allowed to cool and the castings removed in the completed or *C* stage. The intermediate or *B* stage denotes the condition of the partially baked mixture which for some purposes may be removed from the ovens, sliced or stamped and returned to the ovens to be baked to *C* stage plastic.

The uses of the plastic materials are seemingly unlimited. In the engine and body of most of our modern automobiles there are at least 150 different parts which are made of some type of plastic material. An airplane has been cast of a laminated phenolic plastic, "Duramold." The fuselage of the airplane, which is cast in two parts, is made in the time required to rivet two square feet of a metal plane surface and is said to be 7 per cent more efficient in reducing surface drag.

One needs but to walk through the business district of any modern city to see the vast application of the acrylic resin plastics. Plexiglas and Lucite, in addition to the uses mentioned in the foregoing, are being used in the manufacture of furniture and are found on purse handles, umbrella handles, and various other women's accessories. It is also

currently used in great amounts in the manufacture of signs and display fixtures for many types of merchandise. Its quality of light conductivity makes it especially attractive when its surface is engraved or sandblasted or "roughed up" by some other means. One could list thousands of articles that are made of plastics.

Interesting Data Concerning Some Plastics

In order to justify work in plastics as a part of an industrial-arts program, the instructor should teach the students some of the "nice to know" information concerning the most popular types of plastics materials. This information should be presented in as interesting a manner as possible, and should be offered in small units. Samples of the materials discussed should be available for display, as should articles of various types made from the particular plastic under discussion. The following outline presents a brief, but by no means a complete summary, of facts pertaining to a few of the common plastics:

Synthetic Resinoids

Thermoplastic

1. *Acrylics* (trade names: Plexiglas, Lucite)
   - *a*) Excellent optical properties; used for lenses.
   - *b*) Almost unsurpassed transparency; used for windows, windshields, etc.
   - *c*) Is comparatively soft, about the same hardness as pure copper, but scratches can be removed by buffing.
   - *d*) Made by a series of chemical reactions, from such common materials as water, petroleum, and alcohol.
   - *e*) Is obtainable either in clear, crystal form, or in a wide range of colors.
   - *f*) Can be easily formed by heating to approximately 250 deg. F., and after having been formed it will return to its original dimensions upon the second application of heat.
   - *g*) Is very stable, being practically unaffected by weathering, sunlight, and normal temperature changes.
   - *h*) Is less than half as heavy as glass, and is lighter than aluminum or magnesium.
   - *i*) Peculiar in its ability to "pipe" light around corners.
2. *Cellulose acetate* (trade names: Bakelite, Lumarith, Plastacele, Tenite I, and others)
   - *a*) Burns slowly in comparison to cellulose nitrate.
   - *b*) Is the basic material for the interlayer in safety glass.
   - *c*) First used (1910) in safety photo film.
   - *d*) Made of cotton linters treated with sulphuric and acetic acids and acetic anhydride.
   - *e*) Has limitless color range.
   - *f*) Ranks at first place among thermoplastic molding compounds.
   - *g*) Typical uses: combs, toothbrushes, toys, costume jewelry, handles.
3. *Cellulose nitrate* (trade names: Celluloid, Nitron, Pyralin, and others)
   - *a*) Has been, and is commonly called "Pyroxylin."
   - *b*) Its basic materials are wood cellulose or cotton linters, sulphuric and nitric acids, camphor.
   - *c*) Is highly combustible, and will discolor under sunlight.
   - *d*) Has limitless color range.
   - *e*) Is the plastic which formed the foundation of the plastics industry.
   - *f*) Typical uses: fountain pens, pencils, cutlery handles, piano keys, photographic film, ping-pong balls, spectacle frames.
4. *Styrene* (trade names: Lustron, Styron, Styramic, and others)
   - *a*) Is an important ingredient in synthetic rubber.
   - *b*) Is a clear colorless liquid with a spicy odor, and in its solid form will "ring" similarly to glass when it is tapped.
   - *c*) It has excellent electrical insulating properties.
   - *d*) Typical uses: radio parts, battery boxes, condensers, insulation, medical equipment, dials, lenses, etc.
5. *Vinyl* (trade names: Vinylite, Saran, Elvanol, Koroseal, Korogel, and others)
   - *a*) Vinyl plastics include vinyl acetate, vinyl chloride, vinyl butyral, and others.
   - *b*) Mostly derived from acetylene treated with acetic acid or hydrogen chloride.
   - *c*) Typical uses: drafting instruments, recording disks, suspenders, belts, shower curtains, protective coatings, rainwear, insulation, shoe soles, printing plates, sizing for textiles, gaskets, tubing, and others.

B. *Thermosetting*

1. *Phenol-formaldehyde* (trade names: Bakelite, Catalin, Durez, Marblette, Resinox, and others)
   - *a*) Basic ingredients: phenol (carbolic acid) and formaldehyde (formalin).
   - *b*) Derived from coal tar.
   - *c*) Will withstand high temperatures.
   - *d*) Light in weight and has excellent electrical properties
   - *e*) Resistant to alcohol, oil, some acids and moisture, but will soften slightly in hot water.
   - *f*) Typical uses: telephones, radio cabinets, bottle caps, knobs, handles, jewelry, games, trays, fuel tanks, goggle frames, and others.
2. *Phenol-furfural* (trade name: Durite)
   - *a*) Similar in most physical properties to the phenol-formaldehyde plastics.
   - *b*) Furfurals obtained from waste farm products such as oat hulls and corncobs.
   - *c*) Typical uses: abrasive grinding wheels, camera parts, aircraft, electrical parts.
3. *Urea-formaldehyde* (trade names: Plaskon, Beetle, Bakelite, and others)
   - *a*) Similar in many respects to phenol-formaldehyde plastics.
   - *b*) Is more expensive than the phenols.
   - *c*) Molding powder, being clear, affords excellent coloring qualities.
   - *d*) In soluble form is used to make laminates.
   - *e*) Typical uses: electrical fittings, reflectors, tableware, radio cabinets, collapsible tubes, buttons, cosmetic jars, etc.

From this brief outline which covers only a few of the many different types of plastics, the industrial-arts teacher will see that the field of plastics is large and that it offers unlimited opportunity for study and the development of course materials. From an outline similar to the one presented in the foregoing, but which may be expanded in its details, the teacher may conduct his classwork and pass on to the students a great deal of information which will not only be interesting but also informative as to the nature, uses, and characteristics of plastics.

There are certain characteristics of plastics which should be discussed with the students in order to point out the value of these materials in our everyday economic life. As has been mentioned previously, one of the objectives of an industrial-arts program is concerned with consumer knowledge; that is, giving students information which will help them to purchase the products of industry with more discrimination and understanding. In the field of plastics it should be remembered that there are several reasons for its popularity as an industrial material. For example, plastics have a permanent surface. That is, the color of practically all materials permeates the entire mass of the material and, therefore, the finish or color will never wear away. True, the surface may become scratched or dull but the renewal of the finish can be accomplished by sanding and buffing with certain materials which are recommended for the specific type of plastic under consideration. This surface permanence is also an advantage since the majority of plastic articles need absolutely no painting or finishing other than the final polishing which is given during the process of their manufacture.

Another characteristic of most plastics

is the unlimited range of colors which can be obtained through careful control in the manufacturing process. Colors may be obtained in any or every hue of the rainbow or in any degree of transparency from crystal clear to black. There are also many mottled colors available which produce vivid and beautiful imitations of synthetic stones and other materials. These colors are, in most plastics, quite permanent; only in a few of the plastics will the color fade or be affected by sunlight. This wide range of colors makes it very convenient for manufacturing such items as purses, shoes, belts, pins, and costume jewelry which will match perfectly each and every dress a woman might own. The color characteristics of the material also make it very desirable for use in novelties where high color and brilliant luster is desired.

Some forms of plastics are extremely tough, as evidenced by the fact that modern safety glass as used in windshields and windows of automobiles is made with a lamination of a sheet of plastic. Some plastics are also used for such things as hammers where extreme toughness is required and for tool handles where resistance to torsion is of paramount importance. One type of plastic in use today has excellent optical properties, and spectacles made of this plastic are unbreakable and will withstand shocks which would completely shatter ordinary glass. Contact lenses also are being made of plastics.

Articles made of plastics are easily cleaned. Soap and water will not harm the great majority of plastic finishes and such items as lamp shades made of plastic are much easier to clean than those made of the conventional types of material. As has been said, in the cleaning process scratches may be removed by polishing or buffing either by hand or by machine. Since these scratches may be removed it is well to remember that plastics may in many cases be rather easily scratched. Therefore, in the cleaning process one should use reasonable care to select cleaning cloth and cleaning materials which are free of any type of grit.

Most plastics have a comfortable "feel." They may be finished to a smooth silky luster and may be molded to fit the grip of the hand. Their thermal properties are such that they soon assume the temperature of the hand after being picked up. For example, you may pick up a cold telephone receiver made of plastic but it will not remain cold to the touch as long as other conventional materials which have been and are used for that purpose. This characteristic is important where plastics are used for such things as tool handles, door handles, telephones, and other objects which must be handled.

The transparent plastics which are very useful today in packaging materials have certain outstanding properties which make them very adaptable for the purpose. Most of the transparent packaging material is odorless and tasteless, waterproof, airproof, odorproof, and greaseproof and does not dry out. Much of it is nonflammable or very slow burning. The use of this transparent material makes it possible for the customer to see what he is buying whether it be frozen vegetables or packaged candy. This transparency entirely eliminates the tendency on the part of customers to open packages for inspection of the contents.

This is the type of information which industrial-arts teachers should pass on to the students in the study of plastics so as to acquaint them with one of the important materials of industry. It is information which will help them to appreciate the world in which they live, and will help them to understand and value the many products which are available for use today. Additional information of this type stated in clear, concise, and complete terms may be obtained on practically all of the standard makes of plastics by writing to the manufacturer thereof. Samples of material, pictures, charts, and other visual aids will in many cases be willingly sent by these companies for use in the school shop. Moving pictures and slide films are also available dealing with the manufacture of plastics. Industrial-arts teachers and school administrators who are interested in developing a full program of industrial arts are encouraged to take advantage of this source of teaching material which will be of great interest and benefit to American youth.

MORE EMPLOYEES HURT OFF THE JOB

Almost twice as many American workers are killed by accidents away from work as are killed on the job, the National Safety Council reports.

Of the 48,500 workers accidentally killed during 1948, 32,000 or 66 per cent were killed in nonoccupational accidents — in homes, on streets and highways, or in other public places.

Disabling injuries befalling workers totaled 4,600,000 during the year, and 2,650,000 or 58 per cent of these occurred off the job.

Despite the fact that off-the-job accidents occur on the worker's own time, they cost industry heavily. — *Safety News.*

Ben Gallitelli, shop instructor at Edison Junior High School, Elizabeth, N. J., inspects a model built by Manuel Pires for the Fisher Body Craftsman's Guild Contest, General Motors Bldg., Detroit 2, Mich.

A Basic Vocabulary for Related Spelling in a Trade Training Program

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The basic communication skills are listening, reading, speaking and writing. Writing may be subdivided into formal and informal writing, idiom, grammar, vocabulary, spelling, and the mechanics of writing.

In trade training it is commonly accepted that drawing provides the language usually understood by all competent workmen as it applies to their particular occupation. The plans and specifications for a building, a shop, or a machine; the schematic diagram for the interior of a house; and the plot layout for rotating farm crops are common examples of accepted related drawing. Drawing alone, however, is not enough. One has to be able to label drawings and diagrams correctly. In order to be able to do this one has to know how to spell correctly. In this connection, there is a need for a general and a basic vocabulary in auto mechanics, electricity, carpentry, painting, plumbing, printing, shoe repairing, and the various areas usually offered in a trade training program.

Students in a trade training program are not always as academically minded as they might be. They have to be convinced of the value of what they are learning. They need to be shown that people are judged more by their spelling than by their mastery of almost any other subject. From observation you have learned that this is true, and as a teacher you are anxious to give to your pupils the best possible foundation in this all important subject. Here are some suggestions that will help you.

You will need to do some thinking about your general specific objectives. Then you will want to plan your work to achieve these objectives. Above all, you will want to make correct spelling skills habitual with your pupils; in other words to develop spelling power.

The four immediate goals you will want to include are the following: (1) pronunciation, (2) spelling, (3) meaning, (4) use. To master spelling and to use a vocabulary successfully your students should be able to pronounce a basic list of words, to spell the words, to understand their meaning, to use them correctly, and to use this knowledge in the attack on new words.

The following is a basic vocabulary in the following areas: auto mechanics, electricity, carpentry, painting, plumbing, printing, and shoe repairing preceded by a general list. The lists are gleaned from *The Teacher's Word Book of 30,000 Words* by Thorndike and Lorge and *A Combined Word List* by Buckingham and Dolch. One should not assume that these lists are all-inclusive in their particular area but they may be considered basic in the light of their source.

GENERAL

actual
bill
cent
client
cost
customer
dealer
dime
discount
dollar
dozen
earn
earnings
eight
eighteen
eighty
eleven
estimate
few
fifteen
five
fifty
finance
four
fourteen
forty
fraction
Friday
gain
genuine
good
grade
gross
guarantee
half
heavy
help
helper
hire
hour
huge
hundred
identical
implement
inch
income
increase
inferior
inspect
inspection
inspector
instruct
instruction
instructor
insurance
insure
interview
invent
invention
inventor
job
label
labor
laborer
large
length
less
little
long
loose
loss
made
maintain
maintenance
make
manual
many
mark
material
measure
measurement
medium
mend
meter
method
middle
midway
mile
minute
Monday
money
month
monthly
narrow
neat
new
nickel
nine
nineteen
ninety
o'clock
office
old
once
one
order
ounce
output
overalls
owe
own
owner
ownership
paid
part
partner
partnership
pay
payment
penny
piece
place
plain
pound
prepare
price
profit
quality
quantity
quarter
right
result
retail
salary
satisfaction
satisfactory
satisfy
Saturday
sell
seven
seventeen
seventy
several
short
six
sixteen
sixty
size
small
sold
special
spend
standard
straight
strong
Sunday
supply
tall
tax
ten
term
thin
thirteen
thirty
thousand
three
Thursday
time
today
tomorrow
ton
total
trade
Tuesday
twelve
twenty
two
unit
vertical
wage
weak
Wednesday
week
weekly
wholesale
wide
width
work
worker
working
workman
workmen
yesterday

AUTO MECHANICS

adjust
air
anchor
anvil
automatic
automatically
automobile
axle
balance
ball
battery
bearing
block
blow
board
body
bolt
brake
brush
bus
cable
canvas
cap
cast
cell
chain
change
charge
check
choke
clutch
collar
cover
crank
cross
cylinder
dash
diagram
diameter
distance
door
drill
drive
driver
drop
drum
engine
exhaust
extension
fasten
file
fire
flame
floor
fluid
Ford
forge
front
friction
fuel
gas
gasoline
gear
generate
glare
glass
go
grease
grip
guard
gun
hair
hammer
head
heat
highway
hood
horse
incline
inner
iron
jack
jerk
jet
kerosene
leak
length
license
light
line
link
loss
machine
machinery
magnet
magnetic
master
mechanic
mechanical
mechanism
metal
mile
mixture
model
molten
motion
motor
motorcar
motorist
nail
notch
nut
oil
operator
paint
patch
pin
pipe
plate
play
plug
power
pressure
pump
radiator
rear
release
repair
reverse
revolution
revolve
ride
rim
ring
rivet
road
rod

rode
roof
rotate
rotation
round
route
rubber
run
rung
running
rust
rusty

sale
screw
seam
seat
service
shaft
shoe
shop
short
shoulder
show
sleeve
spare
spark
speed

spoke
spray
spring
square
start
steel
steer
stop
street
stud
swerve

tail
tank
taxi
temperature
thermometer
thread
tight
tighten
time
tire
tool
tour
tow
track
traffic
transmit

transportation
travel
traveler
tread
trip
trouble
truck
tube
turn
type

valve
vehicle
velocity

water
wear
wedge
weight
wheel
window
worn
wreck
wrench

zero

ELECTRICITY

aluminum
amber
appliance
arm

bare
battery

cable
carbon
charge
chemical
circuit
circumference
coil
communicate
conduct
conductor
connect
console
contact
copper
core
course
current
cut
cycle

diagram
dial
diameter
direct
discharge
drill

electric
electrical
electricity
energy
engine

filament
fixture
flow

force
formula
fuse

gas
generate
glass

heat

illuminate
indirect
induce
install
instrument
intensity
interfere
interference
interval
iron

juice

lamp
length
light
lit
luminous

magnet
magnetic
molten
motor

negative

oven
overflow

path
plan
plug
pole
positive

power
pulse

quartz

radio
radius
rail
rang
range
rate
ratio
raw
refrigerator
remote
resistance
reverse
revolution

shock
sign
signal
silver
socket
station
steel
stove
switch

telegraph
telephone
terminal
train
transmit
trolley
tube

utility

wave
wind
wire
worn
wound

CARPENTRY

angle
actual
add

adhere
alter
apprentice

apron
arch
architect

architectural
architecture
area

balcony
bar
barrel
bed
bench
bin
block
blunt
board
bolt
bore
box
brick
bridge
build
builder
building
built
bungalow
bunk
bureau

cabin
cabinet
carpenter
carpet
carve
case
casement
ceiling
cement
chair
chalk
chest
chink
chip
chisel
chop
closet
colonial
column
compound
concrete
construct
construction
contract
corner
corridor
couch
craft
crate
cupboard
cut

depth
desk
dimension
door
draft
drawer
drawing
dresser
drill

eaves
entrance
erect
exit
eye

face
file
fill
fireplace
flat

flatten
flaw
floor
foot
frame
framework
front
furnish
furniture

gallon
garage
garret
gate
glass
glaze
glue
grade
groove
gutter
gymnasium

hall
hammer
hang
hard
hardware
hatchet
head
hearth
height
high
hinge
hoist
hollow
hook
horizontal
hotel
hung

indoors
inn
inside
interior

join
joint

keen
kitchen
knife
knives
knob
knot

ladder
latch
leg
length
level
line
lock
loft

mahogany
main
mansion
mantle
maple
match
mill
mirror
modern
mortar
molding

nail
needle
nut

oak
opening
outside

pane
panel
parallel
parlor
partition
paste
peak
permit
pick
pile
pin
pine
pit
plan
plane
plank
platform
ply
point
polish
post
pry

rack
ragged
rebuild
reconstruction
repair
residence
restaurant
restoration
roof
room
rough
rule
ruler
rung

sandstone
sash
saw
scale
scarf
scene
scenery
school
screen
screw
seam
secretary
shack
sharp
sharpen
shelf
shelves
shop
sill
slant
slit
slope
smooth
sofa
spiral
spire
splinter
square
stack
stage
stair
staircase
stairway
stake
stand
stay
steel

step
stool
store
story
stress
strike
string
structure
study
style
support
surface
survey
swing

table
tack

tap
tape
tavern
teeth
theater
thick
thread
tile
tin
tongue
tool
tooth
top
tower
trace
triangle
trim

unlock

wall
walnut
warp
wax
width
window
wood
workshop
wrench

yard

zone

PAINTING

American
antique
architectural
area
autumn

black
blade
block
board
border
brilliant
brown
brush

can
ceiling
chalk
chestnut
cloth
coat
color
colorful
compound
cottage
crack
cream
crimson

dark
decorate
decoration
decorative
design
drop
dry

early
enamel
exterior

fern
fill
finish
first
flat
floor
fluid
forest

gallon
gild
golden
grade
gray
green
grey

hammer
Havana
height
high
hole
house
hue

indoors
inside
interior
ivory

Kentucky
kerosene
knife

ladder
lavender
length
light

mahogany
maple
mix
mixture

natural

oak
oil
outside

pail
paint
painter
painting
pale
panel
paper
pine
pink
pint
Pittsburgh
plaster
proof
purple

quart

razor
red

remodel
residence
restaurant
roof
room
rose
rough

sand
sanitary
scarlet
scene
scenery
school
scrape
season
second
shade
sign
silver
size
sky
sparkle
Spanish
spray
stain
steel
streak
sun
surface

tan
tile
tint
top
trim

varnish
violet

wall
walnut
wash
water
waterproof
weather
wet
white
window
wire
wood
wool

yellow

PLUMBING

bathroom
bolt
bowl

brass

cap

basin
bath

cast
closet
cock
cold
compound
connection
couple
cutter

diameter
die

elbow

fixture
flame
flow
furnace

hack
hammer
hollow
hot

install

iron

jacket
join
joint

kitchen

lead
leak
link

obstruct
oil
overflow

pipe
plug
plumber
plumbing
porcelain

radiator
rust

sanitary
saw
seam
set
sink
sleeve
stock
suck

tank
tile
tin
toilet
tool
torch
trap
tub

union

water
wrench

zinc

PRINTING

acid
advertisement
area
automatic

back
bind
binding
block
body
bond
book
booklet
border
bottom

capital
card
catalogue
chapter
chary
circular
color
column
copy
copyright
composition
contents
count
cover
cut
cutter
cylinder

dagger
die
display
duplicate
dimension

edit
edition
editor
editorial
em
engrave
envelope

face
feed
fiction
figure

fill
finish
flat
fold
form
front

galley
gross
guide

hair

illustrate
illustration
image
impress
impression
index
ink
insert
issue

jacket
journal

lead
length
letter
line
literary
literature

machine
magazine
manila
manuscript
margin
mark
mold

negative
newspaper
novel
novelist

omit
orange

package
pad
page

pamphlet
paper
paragraph
parchment
paste
pen
pencil
percentage
period
phrase
plate
point
pound
post
preface
press
print
printing
printer
program
proof
prose
publication
publicity
publish
publisher
pulp

release
relief
report
reporter
rhyme
roll
roller
Roman
romance
rough
rule
run

sentence
series
set
sheet
shoulder
solid
space
square
stamp
stock
subject
subscribe
subscriber
subscription
summary
syllable
symbol

table
text
theme
thick
ticket
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title
tone
top
topic
tragedy
treatise
trim
type
typewriter

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vertical
vocabulary

width
wood
word
write
writer
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SHOE SHOP

air
alligator
American
attach

back
bench
bend
black
boot
bore
box
brown
bristle
brush
build
built
button

calf
cement
center
chalk
channel
clean
cobbler
cold
composition
construct
construction
cord
cork
counter
crepe
cushion
curve
cut
cutter

down
duty
dye
dying

edge
electric

fabric
felt
finish
fill
flat
flax
foot
fox
French
full

German
glue
grade
grain

half

hammer
hand
heavy
heel
high

hook
hot

impress
impression
iron
Italian

jack

knife

lace
last
leather
lift
light
lining
lip
liquid
lizard
lock

machine
mark
metal
mount

nail
needle
nip

ordinary
Oxford

pad
pair
part
partial
paste
patch
patent
pinch
peg
place
plain
plate
ply
point
powder
power
pull

quarter

rack
remove
rebuild
repair

roller
rough
round
rubber

screw
seam
set
sew
sewing
sharp
sharpen
sheet
shine
shoe
shoemaker
shop
side
skeleton
skiving
slipper
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sort
split
spring
square
stain
staple
stay
steam
stiff
stiffen
stitch
stone
straight
strap
stretch
strip
stuck
style
support
surface
Swedish

tack
tan
tanner
tap
temper
tip
thread
toe
tool
tongue
top
tree
trim
turn

upper

water
wax
white
whole

wing
wood

worn
wrap

HUNTERS HEAR SAFETY ADVICE

Thirty-six per cent of all firearms deaths occur in the last three months of the year, which proves that there is an open season on hunters as well as on game, according to the National Safety Council.

The Council said November is the month when hunting accidents go up with a real bang, although October and December death totals are well above the monthly average.

A survey of hunting accidents in Michigan revealed that just three causes — humans in the line of fire, mistaking humans for game, and hunting with the safety catch off — led to almost two thirds of the accidents in that state.

Other Causes Named

The Council said most hunting accidents can be avoided if these rules are followed this fall:

1. Treat every gun with the respect due a loaded gun. This is the cardinal rule of gun safety.
2. Carry only empty guns, taken down or with the action open, into your auto, camp, and home.
3. Always be sure that the barrel and action are clear of obstructions.
4. Always carry your gun so that you can control the direction of the muzzle, even if you stumble.
5. Be sure of your target before you pull the trigger.
6. Never point a gun at anything you do not want to shoot.
7. Never leave your gun unattended unless you unload it first.
8. Never climb a tree or a fence with a loaded gun.
9. Never shoot at a flat, hard surface or the surface of water.
10. Do not mix gunpowder and aleohol.

— *Safety News.*

According to the 1949 edition of the National Safety Council's statistical yearbook, "Accident Facts," accidents far outrank any of the more generally feared childhood diseases as a cause of death among children 1 to 14 years old.

There were 10,731 accidental deaths in that age group in 1947 — three times more than were claimed by pneumonia, the next most important cause of death. And accidents caused 42 times as many deaths as polio.

Some Leaders in Industrial Education

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(*Continued from page 314 of the October, 1949, issue*)

William Elmer Roberts (Continued)

Among the noteworthy contributions to the Cleveland public schools and to progress in industrial arts made by Mr. Roberts, the following have been discussed briefly thus far: (1) his service as organizer and first principal of the West Manual Training School, the beginning of work of this type in Cleveland under public support and control; (2) his accomplishments as the first supervisor of manual training in Cleveland, appointed with instructions to organize an integrated city-wide program to extend from the kindergarten through the fourth year of high school; (3) his share in the development of the concept and function of the technical high school; (4) his highly successful work with teachers in the study of the principles of design, and his outstanding contribution to the elevation of the artistic standards of the products of the industrial-arts shops, studios, and classrooms; and (5) the significant role played by him in college and university, and perhaps more especially in his work with his own staff of teachers in Cleveland, in raising the standards of preparation of industrial-arts teachers.

The Elementary Industrial School

Equally if not more significant was his part in the planning, organization, and development of the Cleveland Elementary Industrial School, which opened in the fall of 1909.

The Cleveland School was not the first to bear this name, and since it differed substantially in purpose and program from its predecessors, it seems advisable to introduce some comparative data at this point. In order to appreciate events as they unfolded, it is necessary to recall the reports of the two commissions on industrial education appointed by Governor William L. Douglas, of Massachusetts. The first of these reports appeared in 1906, and a second and briefer report appeared in 1907.

The commission recommended changes in the public elementary and high schools that would enable them to meet more fully the needs, not only of the majority of boys and girls who were not headed for college, but also "the needs of modern industrial and social conditions." The commission also recommended that the governor be empowered to appoint a second commission on industrial education, to serve for five years, to be provided with the necessary funds with which to proceed to the establishment of a system of state-supported industrial schools, "independent of and parallel to the public school system." The necessary legislation was enacted and signed by the governor in June, 1906, and at once further study and investigation began. A third and more extensive report was published in 1908.

In 1909, the work of the commission was merged with that of the state board of education; Dr. David Snedden became the state commissioner of education; Dr. Charles A. Prosser was appointed state director of vocational education; and, in 1911, Charles R. Allen was named state agent for industrial education. Within a short time there evolved a comprehensive program of vocational education in connection with the public schools of Massachusetts that attracted nationwide attention, "and inspired action by other states."

The activities and public discussion attending the work of the Douglas commissions resulted more or less directly in the organization of the National Society for the Promotion of Industrial Education, which held its first annual convention at the Auditorium Hotel, in Chicago, in January, 1908, following a preliminary meeting held on June 9, 1906, and an organization meeting on November 16, 1906, both in New York City. The treasury of the society was underwritten by substantial contributions from manufacturers, business leaders, and others, and a vigorous campaign was launched to carry out the avowed purpose of the society, namely, the promotion of a nationwide program of industrial education.

It is difficult for younger students of education in the late 1940's, who did not live through the stirring ten-year period that began in 1906, to comprehend the magnitude and the intensity of the movement. The national society provided dynamic leadership through a succession of vigorous and gifted secretaries, and other officers. A host of organizations representing manufacturers and other employers, organized labor, education, political parties, state and national legislators, and others displayed something approaching missionary zeal in "the cause."

Early Experiments

Mr. Bennett summarizes the situation. "With the increasing demands of manufacturers, labor leaders, and the public generally for more practical instruction in public schools, and with the lessening of opposition to the expenditure of public funds for the teaching of trades, a great variety of experiments in industrial education developed. . . . From this variety of experiments, a few more or less definite types of schools were evolved or were further developed during the ten years from 1907 to 1917." We are concerned here only with one new type of school, the elementary industrial school.

The earliest school of this type to which I can find reference is the Agassiz School, in Boston, in which the industrial experiment began in September, 1907. One hour a day was given to industrial work. The chief difference between the industrial work in the new program and the manual training as previously carried on was said to be that "everything must conform as closely as possible to actual industrial work in real life." The product turned out by the boys was expected not only to be useful, but to be put to actual use. The plan contemplated that the pupils would work on products which could be turned out in quantities, that the shop methods would be practical, and "both product and method must, so far as possible, be subjected to the same commercial tests as apply in industry." The shops produced various items of equipment, furnishings, and supplies that could be, and were, used in the Boston schools.

In this experiment, the emphasis was placed on shopwork, working drawings, and shop arithmetic. At the same time, provision was made for the boy who later decided to change his objective and prepare for high school.

The Rochester Shop School

Another outstanding early example of the elementary industrial school was the Rochester Shop School, Rochester, N. Y., which

opened in December, 1908. Dr. Lewis A. Wilson, now deputy commissioner for vocational education in the New York State Department of Education, was a member of the first faculty, and served as principal for two years, 1909–11.

The Shop School was intended to help solve the problems of boys of ages 14 to 16 years, and "to provide an education with an industrial bias parallel with that having an academic bias which was prevalent in the seventh, eighth, and ninth grades."

The announced aim of the school was not to teach trades, but "to develop efficiency and rapidity in execution, so that those who go out with diplomas may be better fitted to enter their chosen trades than they would be under prevailing conditions."

Beginning with instruction in cabinetmaking, courses were added later in electrical work, carpentry, plumbing, architectural drafting, and machine design. "The school had more the air of a factory shop than a school shop." The length of the course was two years of 40 weeks each, 30 hours a week, paralleling the last two years of the elementary school. In the early years at least, this school did not contemplate preparation for further work in high school and college.

The Cleveland Experiment

This brief description of certain features of the pioneer schools in Boston and Rochester serves to emphasize the contrast with the Elementary Industrial School in Cleveland under Mr. Roberts' leadership. In one sense, the aims in view were nearly identical — "to serve better the needs of pupils of ages approximately 14 to 16 years who were not interested in the traditional, academic, college-preparatory type of schooling." In another sense, the aims were widely divergent.

In Boston and Rochester the experiments were frankly motivated by the aim of aiding pupils who had chosen industry as their goal in their efforts to prepare for wage-earning employment, and to expedite adjustment to the conditions and demands of industry. By contrast with all this, Mr. Roberts approached his assignment from an entirely different point of departure. Conceiving of manual training as an essential and integral element of general education, and convinced that it had potential educational and developmental values as yet unrealized, he addressed himself to an experiment intended to explore the possibilities of a modified type of general education that would be better adapted to the needs of boys and girls who were not attracted by the traditional academic type of schooling.

Before he began work on plans for the Cleveland school, in fact, before he even knew that there was to be a Cleveland school, Mr. Roberts had visited both the Agassiz School in Boston and the Shop School in Rochester. He profited directly by his study of the aims and functions of these two schools, and by his observation of their programs in action.

Mr. Roberts ascribes to Superintendent William H. Elson the credit for the original idea that ultimately found expression in the Cleveland Elementary Industrial School. In June, 1909, he received from Superintendent Elson a four-page memorandum containing the general outline of a plan for a school of a new type. After several extended conferences, Roberts went to work, and he records that "the making of the program and the organization of the school cost an entire summer's vacation."

In his memorandum of instructions Superintendent Elson outlined the assignment in terms of a problem, with a rather general statement of objectives. His idea was "to do whatever we may discover to be most helpful and profitable to pupils of the types we plan to reach," taking it for granted that those who were responsible for the experiment would know much more about what needs to be done after studying the young people who enroll in the school.

Mr. Elson observed that there were many details of the program which could not be foreseen, and added, "my thought is to make provision for a few kinds of work which we are confident are good and will work, and to leave until later the more unusual, uncertain, and more experimental things." He advised against an elaborate outlay and expensive equipment, and against the purchase of any equipment or supplies "we are not sure we shall need." In other words, he indicated that the general policy to be observed in developing the plans should be conservative.

In substance, the assignment was to analyze the needs of the boys and girls; to outline a curriculum and program to meet these needs; to plan the organization of a school and a faculty designed to accomplish the expected results; and to prepare requisitions for the equipment and supplies that would be needed to make the program function.

Some Details of the Plan

The pupils to be served by the proposed new school had been determined after full discussion in meetings of school principals. The classes were to be made up of boys and girls enrolled in the sixth and seventh grades who had passed their thirteenth birthdays, and who were at least two years behind their normal age grades. Each principal of an elementary school was requested to send a number of pupils, boys or girls or both, meeting these qualifications, who, in the judgment of the principal, would be benefited by the transfer. The quota for each school was determined in the central office on the basis of total enrollment and other data furnished by the principals. "The consent of parents was obtained chiefly on the plea that the children were to be given a better chance for progress and promotion."

The problem of overageness or retardation of pupils in the schools was, of course, not a new one. The causes of retardation had not up to that time received adequate study. Among progressive educators the conviction was spreading that there were other causes than intellectual inferiority or lack of ability on the part of the pupils. It was beginning to be recognized that part of the trouble might be in the school and the curriculum, which possibly were meeting the needs of some pupils but not of others. Fundamentally, therefore, the elementary industrial school was an experiment to determine whether certain suggested changes in curriculum, methods of teaching, and organization would prove more effective than the traditional school.

One of the noteworthy features of the experiment was the fact that this was the first example in the Cleveland system of a school organized on the departmental plan below the senior high school level.

The day was divided into nine 45-minute periods, one of which was given to lunch. Some classes were assigned single periods, others double periods. One half of each day was devoted to the usual academic work in English, mathematics, geography, history, and hygiene, all of a thoroughly practical character. The other half of each day consisted of a variety of occupational activities — shopwork, drawing, home economics, assembly hall activities, music, and athletic sports.

"This was a radical departure from traditional elementary school methods, at the same time without sacrificing the fundamentals. The academic studies were intimately related to the daily life experiences of the pupil, including the various school activities. Industrial arts thus became an integral part of, rather than an addition to, the school organization. It gave emphasis to the importance of this subject, making it possible for the first time to demonstrate its value educationally if not industrially."

Roberts records that the highest tribute should be paid to the academic teachers, who entered into the spirit of the plan with enthusiasm. Their attitude showed that they believed thoroughly

in the soundness of the project, and their efforts showed clearly in the results. "The first two graduating classes, tested by the regular eighth-grade examinations from headquarters, passed a slightly higher percentage of pupils prepared for high school than the eighth-grade average of the city."

The Elementary Industrial School began almost immediately to attract the attention of educators, and visitors came from all over the country and even from foreign countries. Two important printed reports of studies of the School appeared, one published by the U. S. Office of Education in Washington, and many articles were contributed to the educational magazines, journals of opinion, and the newspapers.

Significance of the Experiment

In his address to the teachers of Cleveland, reviewing the events of 50 years since his appointment as principal of the West Manual Training School, on November 1, 1940, Mr. Roberts recorded his belief that the Elementary Industrial School was the most significant contribution to the development of industrial arts in Cleveland. "I say this with due regard for the Technical High Schools and the splendid contribution they have made to our public school system. In my judgment, the Elementary Industrial School, while important as an entity in itself, was even more significant in that it was in reality the forerunner, the father, of the junior high school, which has become the greatest advance in public education in the period of my professional life. It was in effect the first junior high school in Cleveland, although at that time the term junior high school was practically unknown."

In a very short time the School was an acknowledged success, and it was determined that what had been demonstrated to be a good thing for a few specially selected pupils should be made available for all pupils. The coming of the junior high schools, the first three of which opened in 1915, "placed an elementary industrial school in every district of Cleveland."

The coming of the junior high school marked a significant advance in the development of industrial arts. "With its advent the status of industrial arts was completely changed. The industrial-arts teacher had finally arrived. Conditions and attitudes changed. Formerly he had been an isolated teacher of an isolated subject, with little relation to his associates in other departments of school work. Now he holds a prominent place as an important factor in a large and intricate organization, a teacher among teachers of other subjects, with the responsibility and the opportunity of placing himself upon a footing of equal social and educational importance with other departments of his school. The importance of this new relationship is recognized in the demands made upon him, in the preparation required of him, and in the duties he is called upon to perform. His educational qualifications are expected to be the equivalent of those of other teachers of his grade and rank. His special training and experience give him an important standing in his school, and the demands made upon him are correspondingly great."

(*To be continued*)

Expanding Curricula With Industrial-Arts Plastic Course

ROBERT LLOYD CANTOR
Professor of Fine and Industrial Arts
West Virginia Institute of Technology
Montgomery, W. Va.

If industrial arts is to provide an orientation to the industrial world in which we live, plastics should be included as a full, major shop-laboratory area in industrial-arts teacher training. The plastics industry is one of our largest national fields of technology employing thousands and thousands of workers. West Virginia Institute of Technology is one of the early pioneers in this new field as applied to the training of future industrial-arts teachers. Most colleges include plastics to some degree in their general shop course; we have in our curriculum a separate shop-and-theory course in plastics which is required of all teacher trainees.

The course provides a study of types, qualities, and properties of plastics and industrial processes (with reasonably priced, small, minimal equipment); experience in cutting, shaping, laminating, embedding, casting, molding, fastening, coloring, carving, fabricating and finishing plastics by hand and power operations; many projects are made from the chemical constituents to the finished products. The last statement indicates an important and unique part of our course content. Too long have plastic hobbyists and school shop teachers limited their projects to shaping plastic stock which has been prefabricated by industry.

A minimum of 15 projects are required of students taking the course. At least one project is due from each of the following fascinating areas:

1. *Fabricated Plastic.* A well-designed project is planned which may entail: scribing, drilling, sawing, tapping, cementing, filing, coloring, turning, buffing, piercing, inlaying, overlaying, grooving, a variety of fastening devices, engravings and surface decorations.

2. *Bending and Forming.* Projects using thermoset or thermoplastic materials; strip heaters, gas and infrared ovens, and heating with steam, boiling water, hot oil, using a variety of wood, metal or plaster-of-Paris pressure forms and vacuum molds; combining processes from area I in the foregoing to produce artistic project. Use of canvas gloves as a safety factor.

3. *Molding* (*Compression*). Duplicating an object and forming a clear, acrylic project (pin or earring, etc.) by combining the individual chemical constituents of methyl methacrylate. Alternative projects are made from nonacrylic molding resins, monomers and polymers, fillers, etc.

4. *Casting Plastic.* Use of slush molds and appropriate resins; Castolite, Catalin, Calresin, Baker, and other casting materials requiring a catalyst or hardener and/or heat; plaster, rubber, sprayed metal casts, etc., are used.

5. *Dipped Plastics.* Producing twist-wire flowers, butterflies, and jewelry requiring cold and hot plastic dips and coloring; with the use of Flexcraft and other suitable plastic compounds.

6. *Injection Mold Processing.* Use of small school shop Plasticor press to *pull* impressions from commercial molds, using Tenite or other thermoplastics; various color effects are attempted; in addition a creative project is required using the Plasticor press (i.e., creating original mold with the necessary injection sprues, etc.).

7. *Embedding.* A multitude of objects are

embedded in a "cake of plastic ice"; Castolite, methyl methacrylate, and other clear plastic resins are used; casting or molding of this project may be done in a variety of forms and shapes depending on student's ingenuity; paperweights, lockets, etc., may be made with embedded flowers, butterflies, pictures, trinkets, and so on.

8. *Laminating.* Combining layers of plastic sheets or plastisols and fabrics: under pressure and/or heat; layers of different colored plastics, plastic and wood or metal, or textiles; pictures may also be laminated within a "sandwich" of plastic.

9. *Interior Carving.* Use of tapered, long twist drills, color dyes and plaster to produce earrings, pins, buttons, pendants, paperweights, doorknobs, plaques, trays, table cigarette lighters, and other internally carved projects.

10. *Synthetic Rubber.* Use of synthetic rubber ingredients to produce rubber stamps and other useful and decorative objects.

11. *Plastic Film Sheets and Threads.* Use of translucent and opaque colored thin sheets and threads; sewed or heat sealed to produce handbags, camera cases, wallets, and other attractive projects.

12. *Plastic Intaglio Project.* Etching by the drypoint process on a clear plastic; an intaglio print is pulled from the plate; the plate is then used to produce a finished project: a picture, top of box, tray, a lamp using the *piped light* principle, etc.; various line fillers are used so that intaglio furrows will stand out visibly and attractively.

Thirty-five films, which are obtained from plastic firms, are shown to students taking the course. In addition, 78 pamphlets which are available from the industry, are used by the industrial-arts teacher trainees.

A Call to Arms for Members of Industrial Arts Clubs

JOHN HURLEY

Assistant Supervisor of Elementary and Junior High School Industrial Arts

Brooklyn, N. Y.

We'll begin by asking pardon for thus breaking out in verse
But to get your full attention, there are methods which are worse.
We wish to call attention to the things we have in mind
For the boosting of industrial arts in your home town and mine.
Now if you think the hangman ought to lay us by the heels,
For continuing this series of poetical appeals;
Blame the whole thing on Bill Shakespeare for he started all this bunk
And we've followed his example though we know our stuff is punk.
This rhyme of ours, if read through, would make the poet squirm
In his grave beside the Avon, like a much tormented worm.
But seriously, craftsmen, what we wish to say to you
As we open up our teaching term, may yours be pleasant, too,
Is — we've planned a busy season your attention to engross
And you've got to stand behind us so's to put our plans across,
For there's two sides to the story, and the most that we can do,
Is to plan a first class program and present the plans to you.
The way you back our efforts either makes or breaks the game
In our success or failure, you, with us, share praise or blame.
Let each craftsman in the outfit put his shoulder to the wheel
We hope for co-operation from the main truck to the keel.
So you bold wind-jamming captains overhaul your spars and gear
And prepare to help your industrial-arts clubs to a most successful year.
If any kind souled member would like to help the game
With a gift of cash for prizes or a trophy in his name,
We'll be thankful to receive it and to use it wisely, too,
Anyway he cares to designate, if such he cares to do.
We're prepared to give you action for every shop afloat,
The big gunned laboratory and the single unit boat.
The natty art craft program with the varied project rig,
And the many sided general shop, fast or slow, small or big.
If in the speedy racing class your program does not fit
You still have opportunities in which to do your bit.
Dust the cobwebs off your thinking, haul your charts from out their case,
Enter your brushed up ideas in our exhibition case.
So get busy all ye craftsmen, do not be an also-ran
When a club event is scheduled, haul fast the mooring can.
Back up the whole darn program all the way from soup to nuts
Sing out "Damn the consequences, overboard with ifs and buts!"
We're developing all round citizens, lads who sail without a fear
So the heck with dry land sailors who hold license to the pier.
Let us show our rival teachers that our subject leads the way
In all kinds of active programs round the shores of general education bay.
So lend your efforts to the cause and each one do his share,
That your good club on closing day, may show a record fair.
Then rest assured the undersigned will feel repaid in full,
Messrs. citizen, student, administrator, you and I and Uncle Sam, too.

Someone recently remarked that the "Iron Curtain" would be torn down overnight if all the people behind it had an opportunity to spend one evening with a modern American mail-order catalog. While we, in America, are not shut in by any iron curtains, it is nevertheless true that we have a job of understanding the problems and viewpoints of other countries. I think that is a job for young men. — *Benson Ford.*

A High School Course in Air Conditioning

V. L. SHERMAN
Glen Ellyn, Ill.

High schools as most of them are presently organized could present excellent lecture and study courses in air conditioning. Air conditioning, as a study, is a field of wide range in fundamentals. As purely an engineering subject the work is too narrow. As a co-ordinated course organized and presented by the several departments of the high school faculty, the students, boys and girls alike, would acquire a practical and very useful item of education. The instructors, professors included, would appreciate the additions to their specialized fields and likely find use for the newer ideas in their domestic problems.

An ideal course in the fundamentals of air conditioning, would be one organized by members of the physics department, the department of biology (for it must include physiology and bacteriology), mathematics, and chemistry. Should the high school have a mechanical drawing department and a sheet-metal shop, work in both would carry the student into practical application. But the course in air conditioning need not include either to be of special value and interest.

The young lady who hopes for a nursing career might well learn why and how the hospital's air conditioning equipment operates, what panel heating and cooling are, and the special attention given to operating rooms, both for efficiency and comfort and in the interest of safety. Static electricity will go beyond the stage of shuffling the feet on the carpet and then snapping the spark to the nose of some friend. Why silk "undies" are taboo around an operating room could easily be demonstrated by the member from the physics department, and the chemistry member could explain the natures of modern anesthetics. These are only one of the many items included in air conditioning.

The American Society of Heating and Ventilating Engineers publishes an annual *Guide*. The 1948 *Guide* contains 35 pages on the subjects of physiological reactions and the prevention and treatment of disease. These carry a total of 53 bibliographical references. The future doctors, after having lectures on relative humidities and their effect on the comfort of patients, might like to know about air sterilization and why 50 per cent relative humidity is presently considered to have the greatest effect in connection with bacteria killers, and why the droplet effect of localizing infected room areas has been discarded. Again, chemistry and biology could step in with an explanation of the glycol vapor used to prevent epidemics in barracks by air-borne "bugs." The physics department could present the case of ultra-violet rays in killing bacteria with curtains of rays between infants' cribs and the ward in general.

The high school is none too early for a start in air conditioning. There are so many facets in the field which only started to grow about 20 years ago. This does not suggest that heating, ventilating, and refrigeration were not well known and well organized years before, but that air conditioning has been presented with and solved so many problems not previously known. Chemistry and physics, together with biology, could explain why ammonia is probably the best industrial refrigerant, but why it must not be used in occupied spaces. Why carbon dioxide is a safe refrigerant but calls for excessive pressures and heavy pumps. How ammonia is safely used in domestic refrigerators. The interesting fact that water boiling at 40 degrees Fahrenheit under a vacuum, threads an air cooling system and by picking up enough heat to raise its temperature by five degrees returns this heat to the boiler to keep the water boiling.

Foundries are calling for the highest talent they can get. Boys headed for this industry should know how and why conditioned air is used in blast furnaces and cupolas. The progress of metallurgy and the requirements of industry have made the foundry a scientific workhouse. The boys should know how and why foundry dust is so carefully collected, and the biologist could deal with the dangers of silicosis. In further regard to the dangers of dust there are thousands of industries where dust explosions might be disastrous. A lecture from the chemistry department on dust explosions and their prevention is exactly in the field of air conditioning.

Again, on the subject of dust, there is the rather amazing story of how Frederick Cottrell and his electrostatic device to eliminate the noxious fumes coming from his plant and to which the community objected, led to the recovery of material previously wasted. The physics department would enjoy describing and demonstrating the electrostatic filter which has been used for years in industry and in the larger air conditioning units and can now be used in small units in the home. Cigarette dust, smoke, and bacteria are stopped in the recirculating air.

This all proves that the proposal of setting up a course in air conditioning for high school students is not unwarranted. The study of the air in which we live and its various states and conditions which affect us physically and promote or hinder industrial processes, is worth any high school student's time. Instead of selecting any single text on the subject, it is better if the chairman of the group proposing to teach air conditioning, obtain a few copies of the *Guide* prepared by the American Society of Heating and Ventilating Engineers (51 Madison Ave., New York 10), and select from it what is to be presented to the class.

The writer taught courses in air conditioning to junior and senior engineering students for a number of years at Lewis Institute with no other equipment than what he could borrow from the physics department, and that which industrial firms generously donated. No industry is more helpful than those engaged in manufacturing air conditioning equipment, and no industry is more alive in keeping up their literature. The doctors from the research hospitals provided me with the best of pertinent lectures which the biology classes always attended.

No course could combine the work of various high school departments to better advantage, and each department would benefit greatly from the combined effort.

Our responsibilities as citizens do not end when we have gone to the polls and voted. The rights which we have today as American citizens are a trust which we must guard and pass along to our successors—enriched, if possible.—*Benson Ford.*

Industrial Arts and Vocational Education
John J. Metz, Editor

THE AGING AND THE HANDICAPPED WORKER

In a survey made by the Chamber of Commerce of the United States and the National Association of Manufacturers in which reports were obtained from three hundred employers from small, medium, and large concerns, it is shown that the physically handicapped and older employees are by no means the burden on industry that they were thought to be a few years ago.

This survey discloses that the seeming shortcomings of these workers are more than offset by consistent good job performance, steadiness and reliability, lower personnel turnover, and less absenteeism. Most of the employers questioned felt that employing these older and handicapped workers had not increased their workmen's compensation costs as had been expected at first.

These findings can also be verified by teachers of adult education classes in which men of sixty and even seventy show an admirable spirit in tackling studies in new fields or in refresher courses that may prepare them to do better the work upon which they are engaged in their daily occupation.

Naturally, some of these handicapped and older employees must be given selected jobs that will not overtax their strength. These jobs must be carefully chosen, and it is here that teachers of vocational and industrial education can render a real service to employers and employees by assisting in analyzing the jobs that these workers can best perform.

Some may think that keeping these workers on the pay roll will prevent the younger generation from getting jobs that legitimately belong to them. At first sight there seems to be much truth in this assertion. Youth must be introduced to work at as early an age as is possible. The young must be taught what it means to earn a living. Youth, however, has the strength and stamina to do heavy work and it is well that they do work that will develop, not only skill, but also strengthen their muscles.

Older workers, and some of the so-called experts before World War II, advocated that men at forty or forty-five were no longer good material for modern industry. Inhumanly, these efficiency boys were going to push men who still had strength and know-how, into the discard. Industry with its vast resources of trained men who plan how the work is to be routed through the shop, and how the raw material is to be brought to the machines and the finished projects to be taken away, have done comparatively little to analyze what should be done with the men who are approaching the autumn of life, and yet have strength and know-how to accomplish much, even if that strength is not as great as it used to be.

Retirement ages and pensions are not the only answer to this question. There are many men who would rather keep on working than retire on a pension, usually much too small for present-day living scale. Even the unions do little in this regard. They, too, know that most men, once put on the retired list, are at a loss to know what to do with their time. Most of these retired men were happier when they still were on the job — why not study this phase of human life and adjust the job to the workers so they can stay on the job if they so desire?

EVERY SCHOOL SHOP NEEDS AN EYE PROGRAM

No matter what shop subject may be mentioned, some operations are included for which goggles ought to be provided for any student who is to work on certain projects.

A. G. Bungenstock, director of safety at the Kearney, N. J., plant of Western Electric Co., says "Eye injuries spare nobody in industrial occupations." He also reports that over a period of 22 years eye injuries occurred to employees in 96 different occupations ranging from bench hands, who suffered the greatest number, through screw machine operators, platers and dippers, welders and wiremen, as well as some clerical workers. Even the supervisors were not spared, for the survey reveals that they sustained 4 per cent of the eye injuries.

The outstanding single cause of these injuries, according to this man, was failure to wear safety glasses, though they were provided.

In two years, at the Western Electric Company's Kearney plant, 3700 pairs of prescription glasses and about 18,000 pairs of planos were issued. During the same period the lenses in 24 pairs of safety glasses were shattered. Undoubtedly every one of these shattered lenses saved an eye.

Most probably, there were many cases in which the impact of the flying body might have been enough to blind an unprotected eye but was not enough to crack the safety lens.

Does the foregoing, taken from a release prepared by the National Society for the Prevention of Blindness, 1790 Broadway, New York 19, N. Y., have any implication for the teachers of industrial arts and vocational education?

We have the students in their teens. If just one of them loses an eye it will mean a lifetime of regret to the teacher, much mental and physical suffering for the students, and probably an appreciable loss of earning power for the stricken person for the rest of his life.

Let's think through this problem, and above all, let's do something about it.

HOW SAFE IS YOUR SHOP AGAINST FIRES?

It is well to emphasize "Fire Prevention Week" with your classes. It is an annual reminder for all to use every precaution possible to reduce fire hazards at home, in public buildings, in summer homes and camp sites, and wherever the ravages of fire could endanger life and property.

While many shop teachers take an active part in these "Fire Prevention Week" programs, it is questionable whether they always make their talks and admonitions on fire control and prevention as objective as possible. For instance, does the class give the shop and the various cabinets used for storage of oils, paints, lacquers, fillers, shop clothing, wiping rags, and the like, a critical inspection during this week to find out whether the shop is as safe as it ought to be?

And, while we are on this subject, have your fire extinguishers been inspected lately, and do you know where you would turn in the alarm if a fire would break out in your shop?

Be on the alert for fires, but also know what to do when a fire occurs.

Interviewing for a Position

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A personal interview is one of the important steps in the process of securing a position, but one which is frequently not given enough thought or preparation beforehand. Many capable and well-qualified applicants do not obtain desired employment simply because they make a poor impression during a brief conference with the employer. These disappointed candidates are often quite unaware of the fact that only some small mistake or omission during the interview may have been all that prevented them from securing the coveted position. Too often they blame the other person for being unfair or prejudiced, when in reality the fault was probably entirely their own.

Purpose of an Interview

When you apply for a position put your best foot forward; let the employer discover the good points that make you the right person for the job. This is the only rule you need to follow, though there are many important details to consider in actually putting the rule into practice.

During an interview the employer is judging you as an individual, and his opinion of you is based on a combination of impressions. Generally these impressions are influenced by your personal appearance, manners, attitude, voice and speech, and how well you answer questions or give information concerning your education and experience. The type of position for which you are applying and the particular interests of the employer will of course determine how much importance is given to any one of your personal characteristics, but usually most employers place considerable value on appearance and behavior, as well as on knowledge and skill, regardless of the type of position. Most employers seek employees who have the personality and manners to get along with fellow workers, voice and speech adequate for everyday communication, and appearance suited to the position.

Manners of the Interview

As soon as you have decided to apply for a certain position make an appointment to see the employer at his convenience. He is likely to be a busy man, and your consideration of his time will give him a favorable impression of your courtesy and efficiency. Be prompt for the interview. Should you be unavoidably delayed use the telephone to explain the situation and to ask for a later appointment.

If the employer has a secretary, give her your name as soon as you arrive for the appointment and then wait patiently until you are called for the interview. Usually the secretary will give your name to the employer. If she fails to do so, you should open the interview by stating your name and the position for which you wish to be considered.

Busy executives conduct interviews in various ways. Some are cordial to an applicant and endeavor to create a pleasant atmosphere; others are efficient and businesslike, a manner which you might interpret as gruff and unfriendly. Regardless of the employer's manner, you should be pleasant and friendly, and as much at ease as is possible under the circumstances. Do not shake hands unless the employer first offers his hand; hold your hat, coat, brief case, or whatever you may be carrying, in your left hand to avoid awkward shifting of belongings in case you do shake hands. Remain standing until asked to be seated. Never place hat or other objects on the employer's desk unless specifically directed to do so.

Allow the employer to take the lead in conducting the interview, and in response to his questions make your answers clear and concise. Avoid abrupt yes and no answers, but at the same time don't talk too much. If he wishes to have you expand the information, he will ask additional questions. Let the employer describe the position and explain the duties; be prepared to ask intelligent questions as the occasion permits. Be a good listener; look at the interviewer but don't try to stare him down. Be tactful and diplomatic in your remarks, and don't argue or interrupt.

The employer will ask you a variety of questions as a means of becoming better acquainted with your training and experience. It is impossible to know exactly which questions will be asked, though you may well try to anticipate certain questions and to think out, but not memorize, possible answers. Such preparation will enable you to meet the questions with more poise and self-confidence than you could if you were totally unprepared. Among questions frequently asked are: "Tell me about yourself," or "Tell me about your education"; "What experience have you had?" or "Where have you worked before?" and "Why do you want to work for us?" or "Why do you wish to do this type of work?" Sometimes the questions will have to do with your interest in hobbies, sports, and recreation, and are designed to discover if you have a variety of interests and a breadth of experience.

"What salary will you accept?" is perhaps the most difficult question to answer. If you ask for too little, the interviewer may think you are not worth much in your own estimation; if you ask for too much, he may feel you would be dissatisfied with the smaller salary he has to offer. Thus, it may not be wise for you to state exactly the amount you expect. Suggest that perhaps the employer is better able to determine the value of your services to his organization, and that you will be pleased to consider any reasonable amount. Then, if the amount is more than you had first considered, you will profit by allowing him to propose the salary; if the amount is less than you believe you can accept, you can discuss the question further or politely decline the position.

Attitude During the Interview

The employer will be trying to determine how your personality will fit the position, and how you are likely to adjust to fellow workers. If you are an agreeable person and get along well with other people, be natural. Take a friendly, positive attitude; be confident of your ability to fill the position, and answer all questions in a frank, straightforward manner. In case you are asked a question you cannot answer, don't be afraid to admit that you do not know. Frankness and honesty are more acceptable than bluff.

Demonstrate your ability to meet new people and new situations. Above all, never make derogatory or unkind remarks about other employers and organizations, or about communities where you have lived and worked. If you criticize and complain during an interview, the employer may look upon you as a troublemaker and decide against hiring you.

Voice and Speech

Most business organizations seek employees who can communicate clearly and effectively. During an interview the employer is probably listening to your voice and speech, as well as to what you are saying. It is, therefore, important for you

to use a clear, pleasant, audible voice, and to speak with reasonably correct pronunciation and articulation. Since voice and speech are important tools of communication in all social and business activities, it is desirable for you to practice good speech at all times in your daily life. You will experience considerable difficulty if you are habitually careless in your everyday speech and then try to change suddenly to correct voice and articulation for purposes of an interview. Needless to say, grammatically correct English is also important at all times, and particularly during an interview.

General Appearance

Clothes do not make the man, but they do help the man secure a position. Richness of dress is not as important as neatness and appropriateness.

Your attire should be conservative but not too plain. An outfit which is acceptable for school or sports is not ordinarily suitable for a business interview. Generally speaking, a business suit, white shirt, and plain necktie and socks are appropriate for men; and a dark dress or tailored suit with hat, gloves, and purse in harmony, and shoes with medium high heels are preferred for women. "Dress for the job" is a good rule to follow, especially if the job is in a bank, store, or office. Such positions demand a reasonable amount of conservative good taste in dress.

Neat personal appearance is also important. Clothing that is clean and well pressed, hands and nails neat, hair combed, and shoes shined are all indications of careful grooming. Cosmetics and light nail polish are acceptable for women, if used with discretion.

In addition to dressing the part, try to act the part. Observe the rules of good posture in sitting, standing, and walking, and show by your manner that you have the health, vigor, and energy to fill the position. Avoid, so far as possible, nervous mannerisms such as nodding your head, playing with jewelry, twisting a handkerchief, playing with your hat, and other physical movements that might distract the listener's attention.

End of the Interview

As soon as the employer has the information he has been seeking he may offer you the position at once, or he may indicate that he will communicate with you later. This is your cue that the interview is ended, and you should leave promptly. Thank him for the time and consideration he has given to your interview, and, if you are still interested in the position, indicate your interest and your willingness to furnish additional information if necessary.

The interview is now finished and you should leave without undue haste or delay.

Whether you take the position or not, you will have the satisfaction of knowing that you have done your best to give the employer a true picture of yourself. If the job is worth anything at all, it is worth the effort you have put into preparing for a satisfactory interview.

Problems and Projects

SCHOOL EXHIBITS

E. W. OSGOOD

Seattle, Wash.

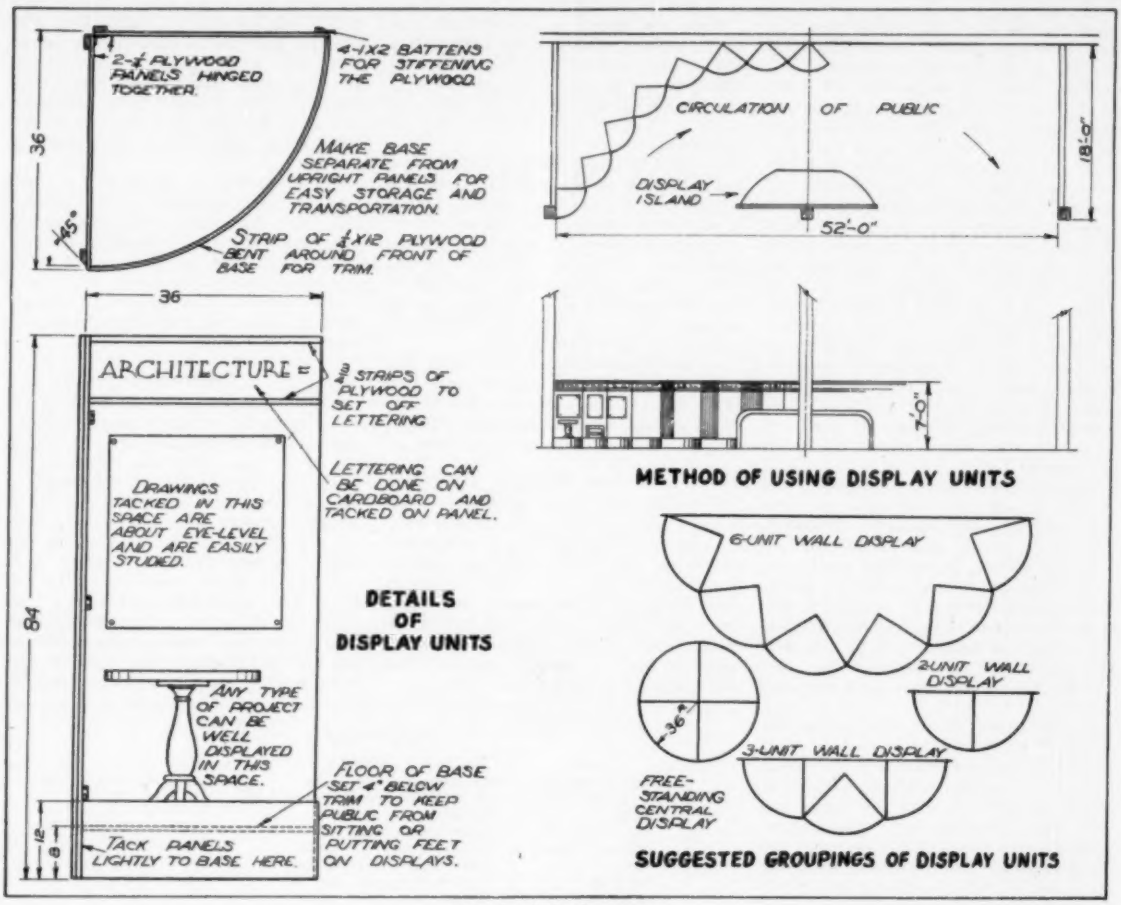
The presentation of school exhibits offers a yearly problem which modern industrial design can help the teacher to solve.

Exhibits are valuable publicity channels and as such should be fully utilized. However, so many schools mass their materials a la drugstore style, stressing quantity instead of quality. They fail to see the psychology involved in the careful arrangement of a Fifth Avenue store window.

The inspiration for the idea described in this article, came from a Ford exhibit that was housed in a circular hall, with displays shown on concave surfaces, at a tangent that drew the onlooker around the building, curious to see what the next section would disclose.

A county fair booth, for instance, does not lend itself to concavity; however, one could use small units, each a separate exhibit in itself, to be studied individually by different groups of spectators. These units should be designed to supply adequate space for show-

Exhibit made up with display units described in this article


2-¼ PLYWOOD PANELS HINGED TOGETHER.
4-1X2 BATTENS FOR STIFFENING THE PLYWOOD.
MAKE BASE SEPARATE FROM UPRIGHT PANELS FOR EASY STORAGE AND TRANSPORTATION.
STRIP OF ¼X12 PLYWOOD BENT AROUND FRONT OF BASE FOR TRIM.
36
45°
ARCHITECTURE =
¾ STRIPS OF PLYWOOD TO SET OFF LETTERING
LETTERING CAN BE DONE ON CARDBOARD AND TACKED ON PANEL.
DRAWINGS TACKED IN THIS SPACE ARE ABOUT EYE-LEVEL AND ARE EASILY STUDIED.
64
ANY TYPE OF PROJECT CAN BE WELL DISPLAYED IN THIS SPACE.
FLOOR OF BASE SET 4" BELOW TRIM TO KEEP PUBLIC FROM SITTING OR PUTTING FEET ON DISPLAYS.
12
8
TACK PANELS LIGHTLY TO BASE HERE.
DETAILS OF DISPLAY UNITS
CIRCULATION OF PUBLIC
DISPLAY ISLAND
52'-0"
18'-0"
7'-0"
METHOD OF USING DISPLAY UNITS
6-UNIT WALL DISPLAY
2-UNIT WALL DISPLAY
36"
3-UNIT WALL DISPLAY
FREE-STANDING CENTRAL DISPLAY
SUGGESTED GROUPINGS OF DISPLAY UNITS

Details of display units

ing drawings. They also make a background for one or two carefully chosen, very good pieces of furniture. The appearance of the whole show should be one of studied simplicity to bring out the inherent beauties of the furniture plus an excellent display for drawings. Each part must be isolated that their merits can be more carefully observed.

Circulation must also be studied, resulting in the use of a paneled island in the center of the show. This forms an aisle down which people must pass in order to see the whole outlay.

The materials used to build the units should be inexpensive, and the units themselves easily repaired and readily changed. They may consist of ¼-in. three-ply veneer as shown in the working sketches. Calcimine may be sprayed on as a finish with a spray gun. Each panel is hinged so that one or more may be used in a variety of arrangements for spaces other than a fair booth. The color scheme may be made up of three shades of neutral gray blue; light for the background of lettering, medium for the panels, and dark for the base. The lettering is done on strips of paper and then glued to the panels. Moldings of plywood in the color of the panels should be used to hold the edges of the top strips of lettering. The units are most flexible in use, as drawings can be mounted and set in place before going to the display section. The illustrations, designations, and descriptive signs may be fastened to the plywood with yellow thumbtacks.

Advantages of this method are: the ease of transportation, the time saved in preparation, and the re-usability of the group. Thus, architecture, boat drawing, lettering, and woodshop may be displayed on one occasion, and then the panels and units may be used for machine shop and machine drawing at some other time.

Driving a car is twice as dangerous in rural areas as in city areas, according to the National Safety Council. Higher speeds on rural highways account for much of the hazard. — *Safety News.*

THE "HUNTER AND FISHERMAN" SKIFF

FRANCIS E. JOAS
Rufus King High School
Milwaukee, Wis.

The skiff described herein has been designed to achieve several specific aims, namely:

1. To provide a safe and seaworthy combination fishing and hunting boat;

2. To be simple in construction so that anyone who has some skill in the use of common woodworking tools may be successful in building it;

3. To utilize stock materials to the best advantage and thereby keep the cost low;

4. To provide a craft that is light and portable, will row or handle well with small outboard motors, and provide years of rugged service with little maintenance work.

Materials

Materials have been specified to best suit the function of the part for which each is

employed. The bill of material included with these instructions names materials that should be stock items and easy to obtain in any locality. There are others that will serve equally well. The sizes specified are approximately finished sizes. Some cutting to length and trimming will be done as the work progresses, where it can best be done when certain stages in the construction is reached.

Materials may be obtained from lumber dealers, mills making or dealing in builders millwork, specialty shops, plywood dealers, hardware or marine supply stores, etc. All lumber should be clear, that is, free of all defects, and straight grain. It should be suitable for the purpose for which it is selected. If the dealer is told that the stock wanted is for building a boat, he will either select clear, straight-grained pieces, or permit the purchaser to do so. Plywood must be of the *waterproof* variety. It should be sound and sanded two sides. Water-resistant plywood is not suitable.

If power woodworking machinery is not available it will save much time and effort to have certain pieces such as side and bottom frame stock, chines, sheer molds, inner and outer keel, coaming battens, floor boards, etc., ripped to size and dressed as required. Having the chine *bevel* ripped or jointed will save much time and hand labor. Millwork establishments have the equipment to do this work and if the stock is purchased from them, they will size the material for a small additional charge.

Flathead wood screws will be the only fastenings required, and for ordinary usage cadmium-plated steel screws will be satisfactory. If, on the other hand, the boat will be subject to continued use in the water, then solid brass screws are to be recommended. They will cost from two to three times that of the cadmium plated; however, they will be permanent. It might be well to point out now that brass screws are much softer than steel, and therefore, will not withstand the driving pressure of the steel screw. This may make some difference to the inexperienced. A little experimentation with both kinds, into scraps of the wood to be used, may help to make a decision before purchasing the screws. The sizes specified are obtainable in most hardware stores.

Some sandpaper will be required and the garnet type is to be recommended. Several pieces of 9 by 11-in. grade No. ½ and 00 will suffice.

Outside house paint is not suitable for boats as it becomes soft and spongy in water. Many paint manufacturers make a marine paint and its use is to be recommended. If this is not obtainable then use an outside porch and deck paint which will give satisfactory results. Color will depend on desires of owner, but it should be pointed out that for both fishing and hunting an inconspicuous color that blends into the water and surrounding landscape is fundamental such as olive drab or dead grass. If one uses the skiff much of the time for hunting, then a *flat* or *dead* finish without gloss is most desirable.

There are several waterproof past type marine caulking cements on the market which will be used to make the seams watertight during the course of construction. If one of these cannot be obtained locally, *white lead paste* or *roofers asphalt paste* may be substituted.

The *form* to support the boat while building will need to be straight and 12 ft. long, and can either be a 2 by 6 or 2 by 8-in. lumber. It need not be new lumber.

Crating or other old or used lumber can be used to make the supporting legs and bracing for the form. Crating lumber can often be obtained from local furniture stores for the hauling. A few nails will be required in suitable sizes to build the form.

In selecting materials bear in mind that the final weight of the boat will depend on the individual weights of the parts used. Try to get as much strength as possible with light weight in the various materials you select.

Tools Required

The tools which should be on hand before actually commencing work are common woodworking tools. They should be of good quality and should include the following: hammer, fine-tooth crosscut saw, a ripsaw if you intend to do your own ripping, jack plane, try-square, T bevel square, hand drill, assortment of twist drills, automatic screw driver, auger bit brace and assorted auger bits and screw driver bits, several wood chisels, a 2- or 3-ft. rule, at least 6 *C* clamps from 3 to 6 in., and a number of small *quilting clamps*. These tools are the minimum that you can get along with. Many other woodworking tools may come in handy. Power machinery, such as a circle saw, band saw, jointer, and light portable electric drill, will be useful if available.

The importance of having cutting tools sharp, and keeping them sharp cannot be overemphasized. This makes for faster and easier work plus better results. Experienced woodworkers know this; beginners are likely to neglect the proper care of tools.

The automatic screw driver is a necessity when there is a large number of screws to drive.

Construction

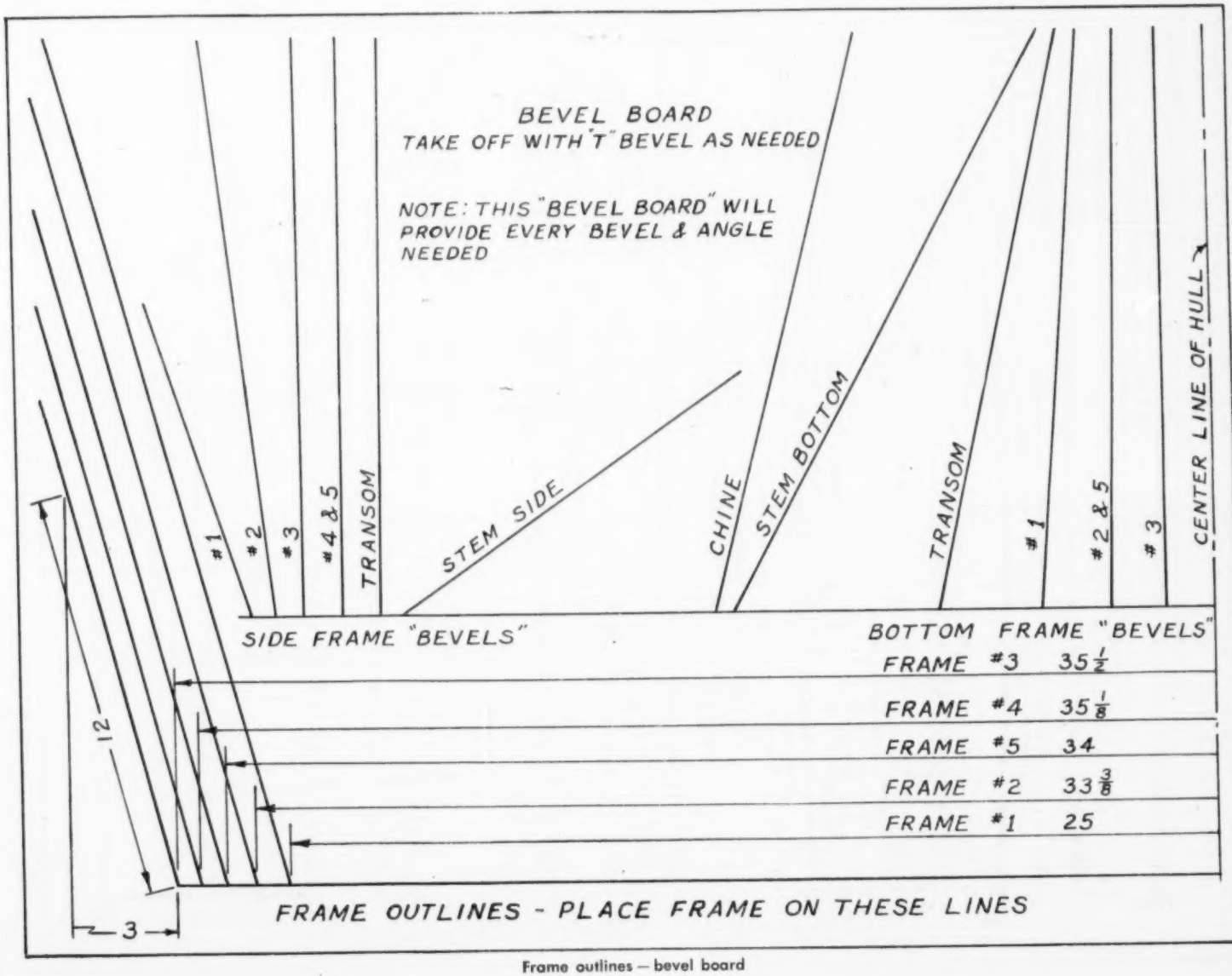
Frames: The frames, of which there will be five in number, consist of two side members and a bottom member. The sides are cut from the ¾ by 3-in. stock and should be cut longer than the required finished length, as they will be cut to size after the hull is partially complete. Nos. 1, 2, and 3 can be cut 16 in. long, Nos. 4 and 5, 15 in. long. The sides of the transom frame should be 14 in. long, and the bottom frames are cut from ¾ by 1 5/16-in. stock and should be cut 2 in. longer than dimension on the frame drawings. Next number the frame members so that you will have two sides and one bottom for each frame according to the position they will oc-

BILL OF MATERIAL

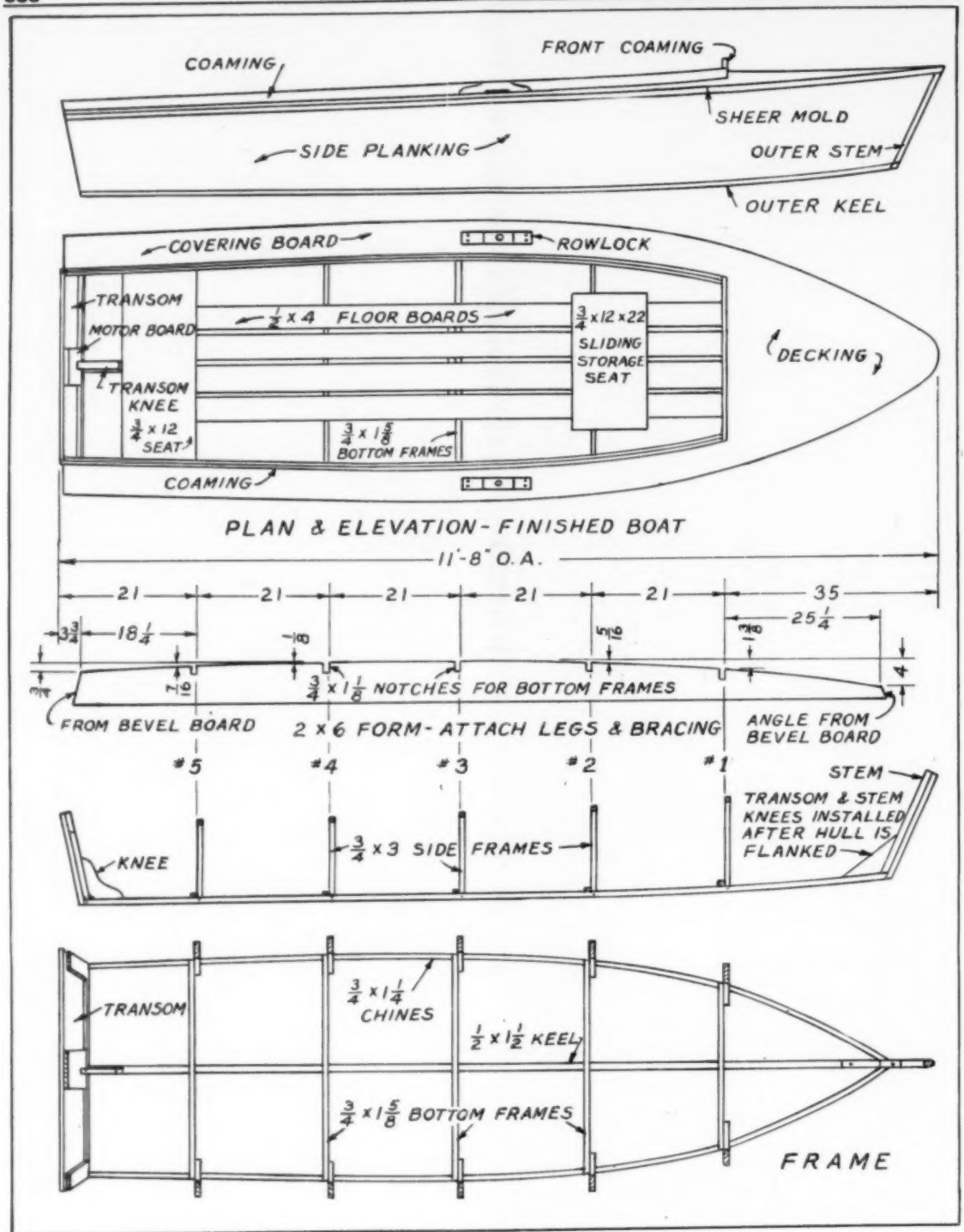
No. of pcs.	*Part*	*Material*	*Size*
2	Bottom and sides	Fir plywood (waterproof)	¼ x 36 x 144 in.
1	Deck and covering	Fir or birch plywood (waterproof)	3/16 x 48 x 72 in.
1	Form	Softwood	2 x 6 x 12 ft.
1	Side frames	Western pine, cedar, spruce	¾ x 3 x 16 ft.
1	Bottom frames	Western pine, cedar, spruce	¾ x 1⅝ x 18 ft.
2	Chines	Western pine, cedar, spruce	¾ x 1¼ x 12 ft.
2	Sheer moldings	Western pine, cedar, spruce	¾ x 1⅝ x 12 ft.
2	Coaming batten	Western pine, cedar, spruce	¾ x 1¼ x 10 ft.
1	Transom	Western pine, cedar, spruce	¾ x 15 x 40 in.
1	Inner keel	Western pine, cedar, spruce	½ x 1½ x 12 ft.
4	Floor boards	Western pine, cedar, redwood	½ x 4 x 7½ ft.
1	Seats	Western pine, redwood, cedar	¾ x 12 x 6 ft.
1	Motor board	Oak or hardwood	¾ x 6 x 14 in.
1	Outer keel	Oak	¾ x 1⅝ x 11 ft.
1	Stem	Oak	1½ x 2 x 18 in.
1	Outer stem	Oak	¾ x 1⅝ x 18 in.
3	Floor board cleats	Oak	¾ x 1⅝ x 18 in.
2	Seat risers	Oak	¾ x 1⅜ x 24 in.
1	Deck beam	Western pine	¾ x 3 x 32 in.
1	Deck stringer	Western pine	¾ x 3 x 32 in.
1	Knees	Oak	1⅝ x 3½ x 20 in.
1	Front coaming	Western pine	¾ x 6 x 26 in.
2	Filler blocks	Any hard wood	1⅝ x 3 x 22 in.
1	Rowlocks	Oak	2 x 2¾ x 20 in.

Note: All stock to be clear, straight-grained and surfaced 2 sides and 2 edges.

1 gross	Flat head wood screws cadmium plated or brass	No. 6 by ¾ in.
3 gross	Flat head wood screws cadmium plated or brass	No. 6 by ⅞ in.
6 doz.	Flat head wood screws cadmium plated or brass	No. 8 by 1¼ in.
6 doz.	Flat head wood screws cadmium plated or brass	No. 8 by 1½ in.
2 doz.	Flat head wood screws cadmium plated or brass	No. 10 by 1¾ in.
8 only	Flat head wood screws cadmium plated or brass	No. 12 by 2½ in.
1 pt.	Marine caulking compound	
2 oz.	Weldwood waterproof glue	
2 qt.	Marine paint	
1 pr.	6-ft. spruce oars	
1 pr. ea.	North River pattern oar locks and sockets (galvanized)	
1	Screw ring bolt (galvanized)	
4 yd.	Candlewicking	



Frame outlines – bevel board



Frame of skiff

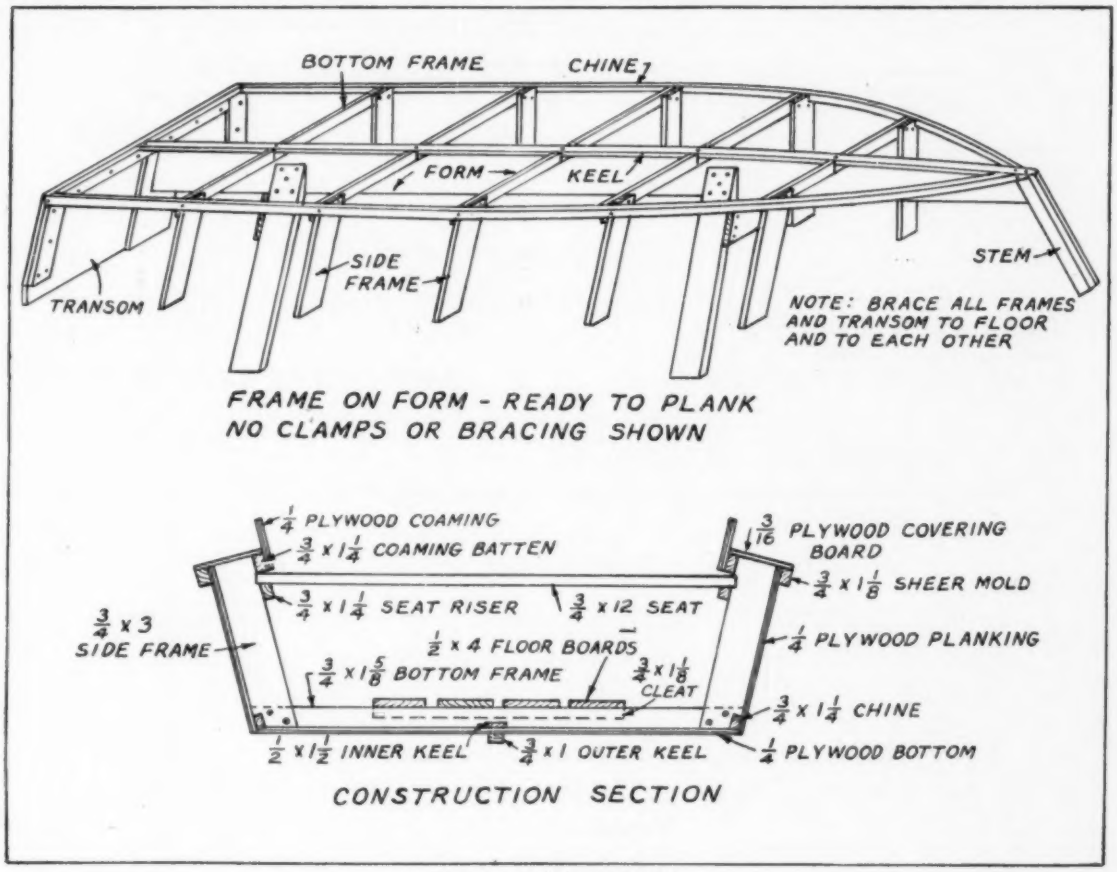
cupy in the boat from Nos. 1 to 5. Now bevel one edge on each side frame according to the bevels given on the drawing showing the *Frame Outlines* for each specific frame. *Pick up* the bevel with the bevel square from the drawing showing the frame outlines, and then plane the edges to conform perfectly to these bevels as indicated. Use the bevel square to test. Do the frame outlines, and then plane the edges to conform perfectly to these bevels as indicated. Use the bevel square to test. Do likewise for the bottom frames as required on Nos. 1, 2, and 3. The inner edges of the side and bottom frames may be given a small rounding or chamfer to soften the edge. You are now ready to assemble the frames and this work should be very accurate as the shape of the finished boat will largely depend upon the accuracy of the frames. Two No. 8 by 1½-in. screws will be used in each frame fastening and should be so spaced that they will not interfere with the notch for the chines.

See Figure 1. The stock can be laid directly on the frame outlines in assembling and then checked back against the dimensions given on the drawings. Remember in assembling that the side frames are mounted toward the stem and the bevels point to the stem, from frame No. 3 forward. It is advisable to use a waterproof glue in these frame joints when assembling just prior to driving the screws. After assembling frames the protruding waste can be sawed off flush with the bottom and side members and at the same angle. See Figure 2. Now find the exact center on the bottom side of each bottom frame and lay out and cut the ½ by 1½-in. notch for the keel. On frames Nos. 1 and 2 the bottom of the notch carries the same bevel as the frame bottoms. See Figures 3 and 4. The notches at either end of the frame can be laid out and cut to receive the chine. These notches must follow the same bevels and angles as the frames. If you cut off about a 1-in. length of the chine, this piece can be used as a template in laying out the notches for chines. See Figures 5 and 6.

Transom: Lay out the transom on your stock as shown in Figure 7, and cut to shape. Bevel the bottom edge according to the bevel given on the bevel board. Use bevel square to test and check. The side frames on transom had best be notched first to receive chines before fastening frames to transom. Use five No. 8 by 1½-in. screws in each side frame. The bottom frame should be beveled same as bottom of transom. Lay out and cut ½ by 1½-in. notch in direct center for keel before fastening to transom. Use six No. 8 by 1½-in. screws. These frames should also be glued with waterproof glue before screwing to transom. The motor board can next be cut, fitted, glued, and screwed into place. Use eight No. 8 by 1½-in. screws. If you are using a hardwood motor board and a softwood or plywood transom it is best to screw through transom and into the motor board. This completes the transom shown in Figure 8. The cut for coaming and covering board will be made later.

Stem: The stem is merely beveled on two sides to conform to the bevels given on the bevel board. The lower end is mitered to the angle shown on the bevel board. See Figure 9.

Form: Lay out and shape form according to drawing. Attach legs and bracing to hold the form rigidly at the desired height. The form must be accurate to assure correct spacing of the frames. The notches to hold frames are the same size as frame cross section ¾ by 1⅛ in. Used lumber or crating material can be used for supporting the form.



Form on which frame is built

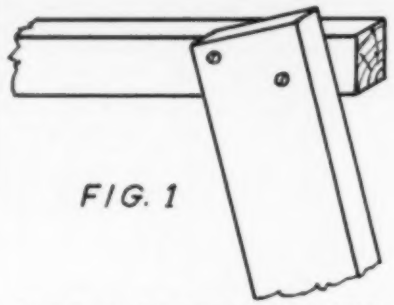


FIG. 1

SIDE & BOTTOM FASTENED

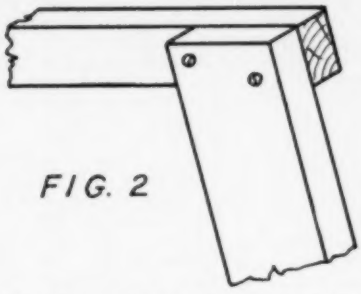


FIG. 2

SAME - SAWED FLUSH

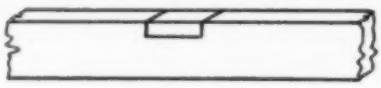


FIG. 3

LAYOUT—NOTCH FOR KEEL

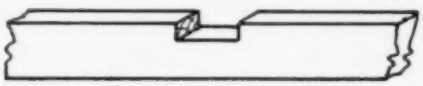


FIG. 4

NOTCH FOR KEEL CUT

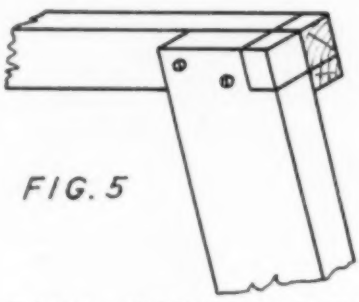


FIG. 5

SAME - MARKED FOR CHINE

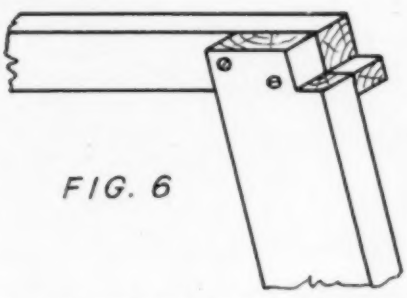
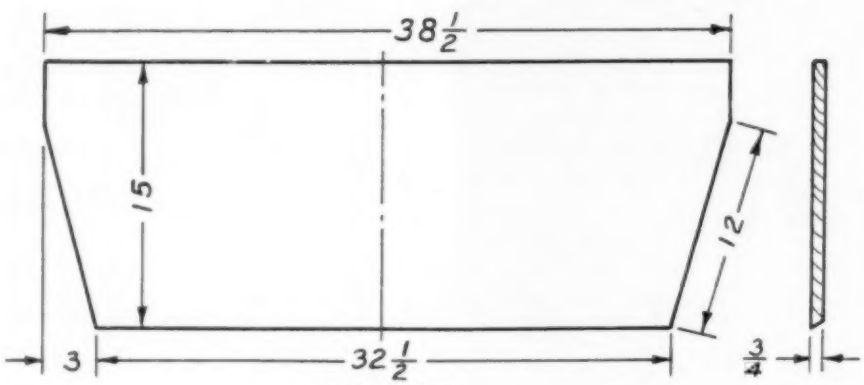


FIG. 6

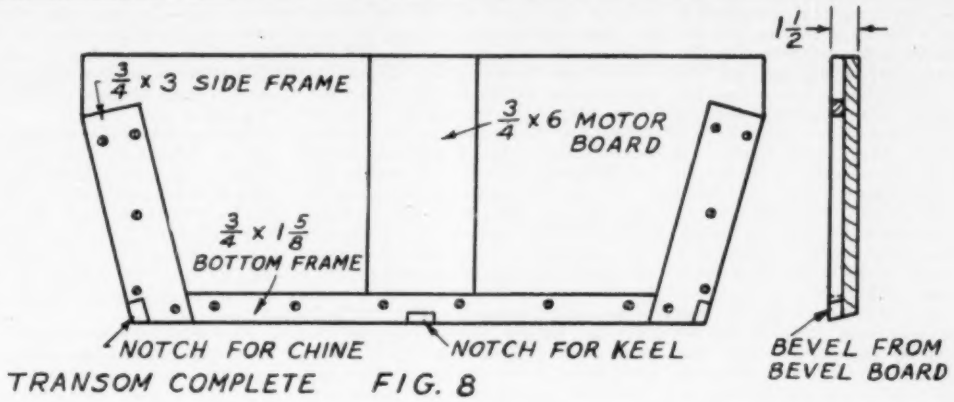
SAME - NOTCH CUT FOR CHINE



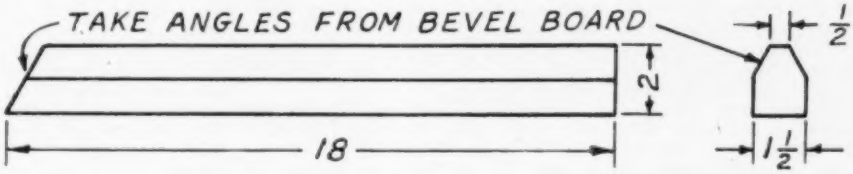
TRANSOM

FIG. 7

Figs. 1, 2, 3, 4, 5, 6, and 7. Making the frames



TRANSOM COMPLETE FIG. 8



STEM FIG. 9

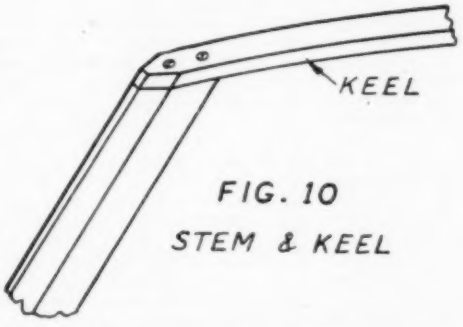


FIG. 10
STEM & KEEL

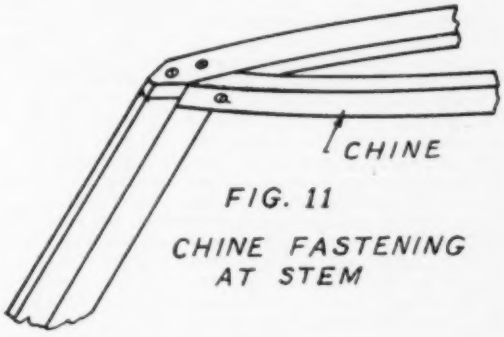
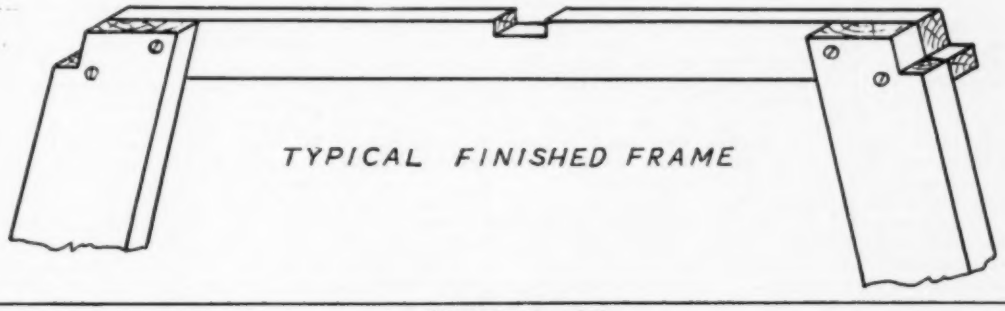


FIG. 11
CHINE FASTENING AT STEM



Figs. 8, 9, 10, and 11

Assembly: The frames are now placed in their respective notches on the form. The keel is screwed to the stem with two No. 8 by 1¼-in. screws and end trimmed. See Figure 10. Clamp stem and keel into position on form and frames. Fit keel into respective notches on each frame bottom and fasten with one No. 8 by 1¼-in. screw. Hold transom in place and mark and cut keel to length. Fasten keel to transom same as frames. Square transom with keel and brace; do all frames likewise so that each frame is square with keel and parallel to each other. Brace securely as there is a tendency for the frame to get out of square when the chines are bent into place.

Chines: Bevel one edge of chine to angle as given on bevel board. Cut ends of chines to fit notches in transom and clamp chine in place up to frame No. 2, working alternately on both sides, and fasten chine to each side frame with one No. 8 by 1½-in. screw. Now bend both chines to the stem and tie together so that you can mark length of chine and get the proper bevel at the same time. It is difficult to mark exact length, so better cut a little long and then through the *trial and error system* saw and plane it down to an exact fit that will permit the side and bottom planks to lay flush with chine and stem. Fasten chines to stem. See Figure 11. Some prefer to make this stem cut on chine first and then work from stem to transom in fastening chine. Working from the transom forward will help to *stiffen* the frame as you progress so that in making the forward bend the shape of hull is not disturbed. Do not fasten the chine to frame No. 1. Make sure that chine seats well in all frame notches. At this point it is well to *fair* chines and transom bottom using the plane so that chine is flush with each frame and makes a perfect seat for the bottom and side planking. Care and accuracy at this point will help to insure a dry boat!

Bottom Planking: Place the ¼-in. plywood for the bottom in position on bottom and clamp for marking. Mark carefully for curve of chine. Remove and saw to shape allowing enough waste to permit planing to a fair curve after plywood has been fastened in place. A band saw will save time and do a fine job in cutting plywood. Return plywood to frame and lay out holes for screws. The holes should be spaced about 2½ in. apart and centered on the chine. Drill all holes for the No. 6 screw. Screws should be staggered at the transom and spaced about 1½ in. apart. Screws into the bottom cross frames can be about 4 in. apart and along the keel about 6 in. Coat edge of chine and transom with the marine caulking compound and lay a few threads of candlewicking along the edge of the chine and transom. Clamp bottom in position and fasten along chines, transom, and cross frames, with the No. 6 by ⅞-in. screws and along the keel with No. 6 by ¾-in. screws. When finished the squeezed-out compound should be removed and the edges of the plywood planed down flush and smooth with the chines and transom to make a "fair" smooth surface for the side planking.

Side Planking: Side planking is next cut from the 36 by 144-in. piece of ¼-in. plywood according to the drawing, clamped into place working from the stem, and screw holes located along chine, transom, and stem. Holes should be staggered at transom and stem. Remove and drill all holes for the No. 6 screw. Coat chine, transom, and stem with the caulking compound, lay a few threads of candlewicking, clamp plywood into position and tight along all frames. Care must be taken to see that the edge of the planking follows the shape and curve of the chine so that as little trimming as possible will be necessary. This will insure the full required height of the sides of the hull. Fasten with the No. 6 by ⅞-in. screws. One screw can be placed into the side frames near the top edge of the plywood. Remove surplus compound and plane edge of plywood flush with the bottom. Do likewise for the opposite side. Saw overhanging plywood at stem and transom a bit oversize so that you can finish by planing down to a *fair* and smooth finish.

Outside Stem: Shape outside stem by beveling sides to conform with angle of side planking. Drill holes and fasten with No. 10 by 1¾-in. screws permitting it to overhang the bottom about 1½ in. Plane sides of stem flush with side planking.

Outside Keel: Cut one end of outside keel to fit snugly against slope of stem and fasten in place with No. 8 by 1¼-in. screws about 4 in. apart. Cut end flush with transom. The outside stem extending over keel should now be cut and finished flush with keel. This then completes the work that can be done with the hull in this position.

Remove Form: Remove all bracings and fastenings that hold hull rigid and lift hull free of the form. Now place the hull right side up upon saw bucks or other arrangement to hold hull at a convenient height while completing the work on the top side.

Sheer Moldings: Clamp sheer molding to upper edge of side commencing at the transom and flush with the plywood. While in this position fasten from inside through plywood and into molding with No. 6 by ⅞-in. screws spaced about 3 in. apart. Cut forward end flush with stem. When both are in place, cut and shape stem end of sheer molds to form a graceful rounded nosing. A small rounding will give a good finish on transom end. See Figure 12. Mark all side frames flush with top side of sheer mold and square with side planking. Saw side frames to length. This should include frame on transom.

Knees and Seat Stringer: Shape, fit, and install transom and stem knees according to full-size drawings from 1½-in. stock, and fasten them securely in place with two No. 10 by 1¾-in. screws in each. These will help to resist shock and stiffen hull. Fasten the seat stringers to frame No. 5 and transom frames with No. 10 by 1¾-in. screws at the desired height.

Deck Beam: Lay out and shape the deck beam according to drawing at frame No. 1. A string and pencil can be used to scribe this arc or a small batten can be bent into position and then marked along the batten. Install deck beam so that top edge is flush with top edge of sheer mold and fasten with one No. 8 by 1½-in. screw on either side. Now cut protruding inner and outer stem flush with sheer mold. Mark and cut deck stringer to length and install by partially notching into stem and deck beam. Fasten to deck beam and stem with screws.

Coaming Batten: Commencing at transom cut and fit coaming batten to fit transom. Clamp in place along frames and flush with top ends of frames. Fasten to each frame with one No. 8 by 1½-in. screw, and make it flush with the top end of side frames. Finish cutting transom to receive covering boards and coaming. See Figure 13. Fair up all top framing so that the decking material will lay firm on frame.

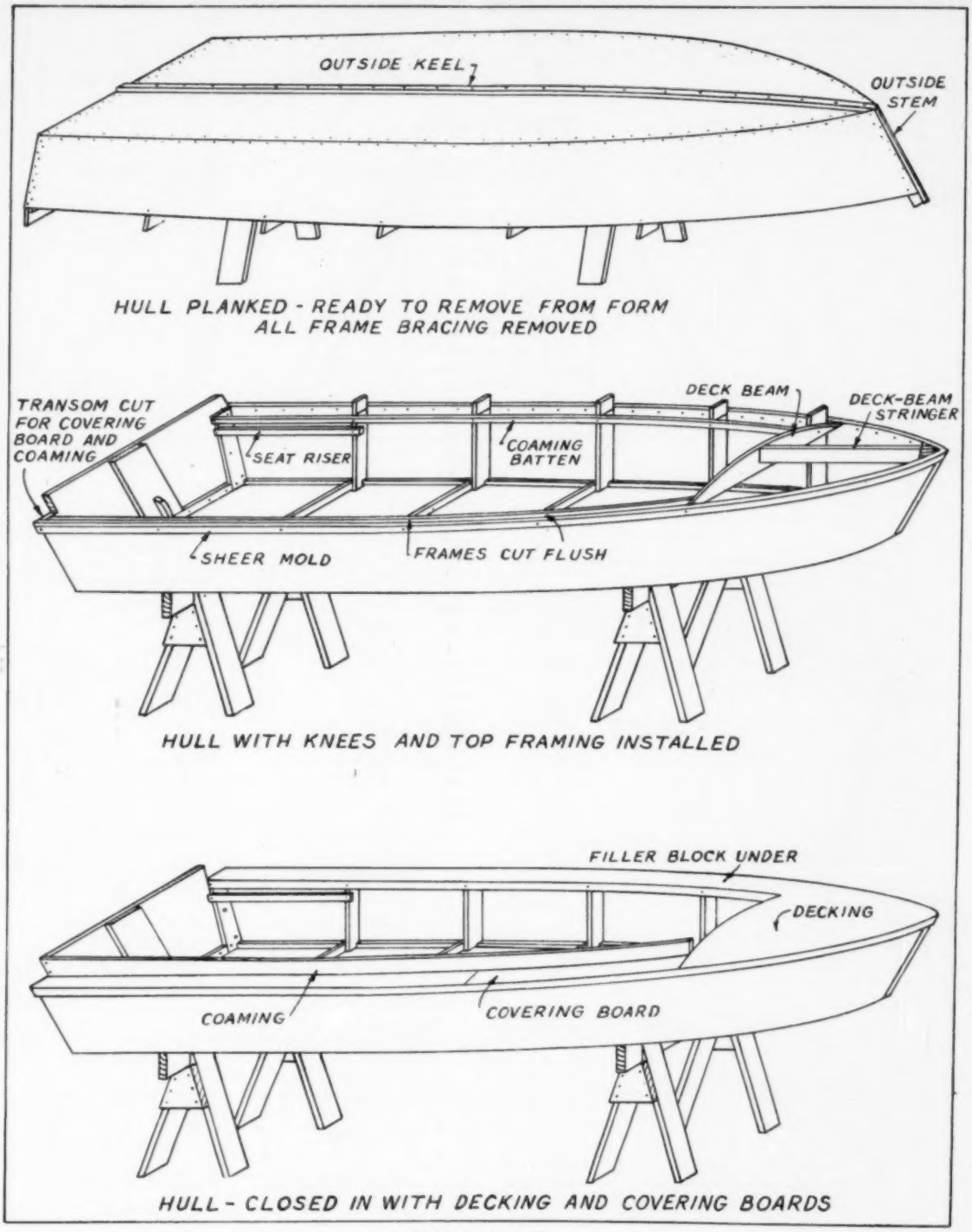
Filler Blocks: Filler or wood blocks should be installed flush with sheer molding and coaming battens between frames Nos. 2 and 3. Cut from 1½-in. stock and fasten with screws through frames into ends of filler blocks with two No. 10 by 1¾-in. screws at each end. These filler blocks provide a firm anchorage for the rowlocks and for the joints of the covering boards.

Stern Seat: Cut the ¾ by 12-in. seat stock to length allowing a good bearing on the seat risers. Soften the four edges by either rounding or chamfering. Install seat by screwing to seat riser using three No. 8 by 1½-in. screws at either end. Placing the seat well forward, tight to frame No. 5, will give more comfort in using an outboard motor.

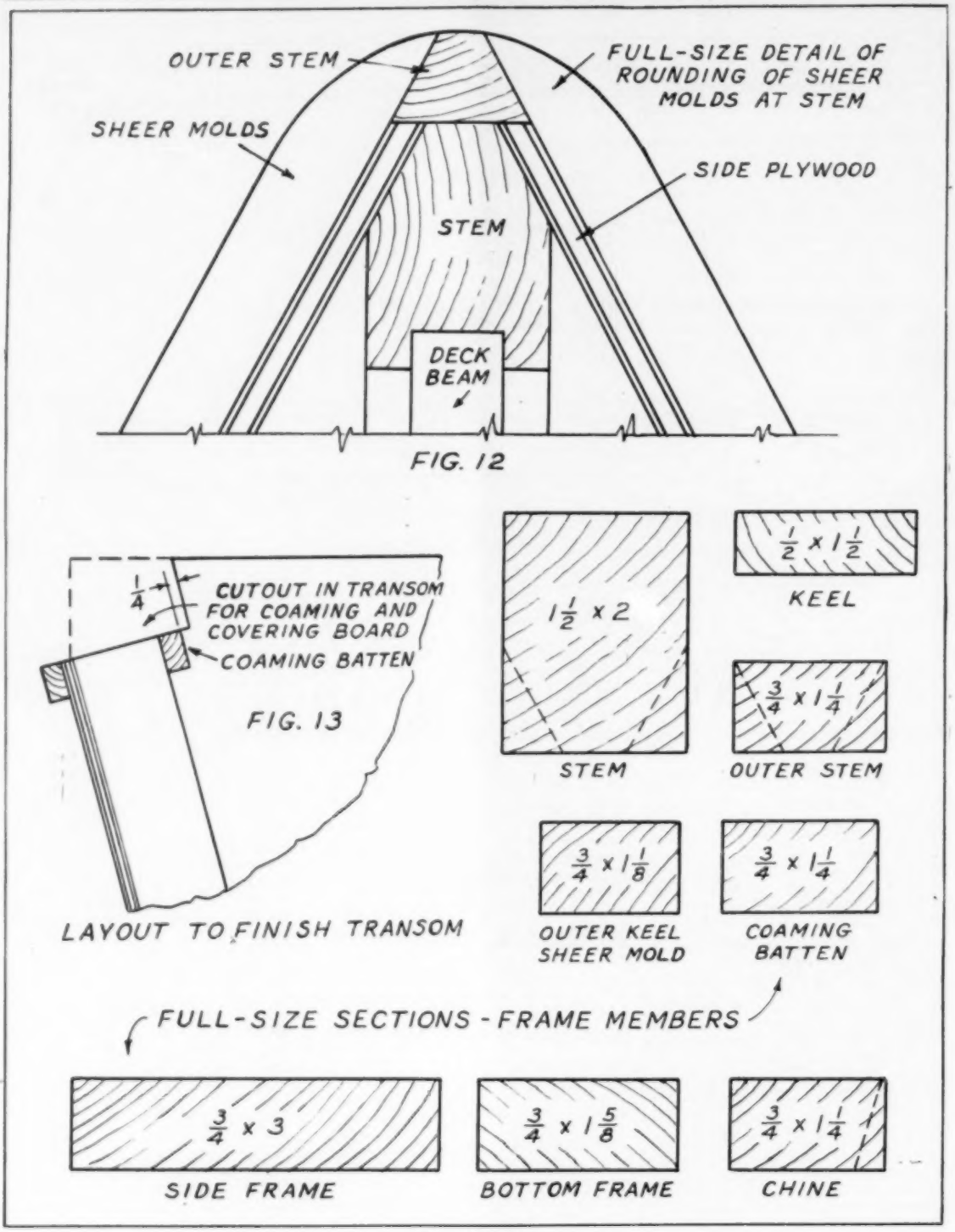
Interior Painting: It is suggested that at this stage of the work the interior be thoroughly cleaned and given at least two coats of paint. The first coat should be a prime coat. After the decking and covering boards have been installed it will be difficult if not impossible to reach all of the parts. It should be pointed out here that it is advisable to paint the underside of the decking and covering boards before they are fastened into place.

Decking: Clamp a straight board to the inside face of the deck beam allowing it to extend several inches above the top of the beam. Now clamp a section of the deck plywood, with the square edge up to this board, down to the sheer molding on both sides. Mark the outline of the deck to shape, remove and cut, prepare screw holes, etc., same as for bottom plywood. A little fairing on the top edges of the sheer molds before fastening decking may be necessary to insure a smooth curve on the decking and a good joint at the sheer mold. Coat the sheer mold with the caulking compound and fasten to sheer mold and deck beam with No. 6 by ¾-in. screws spaced about 2½ in. apart. Remove surplus compound and plane edges of decking flush with face of sheer mold all around.

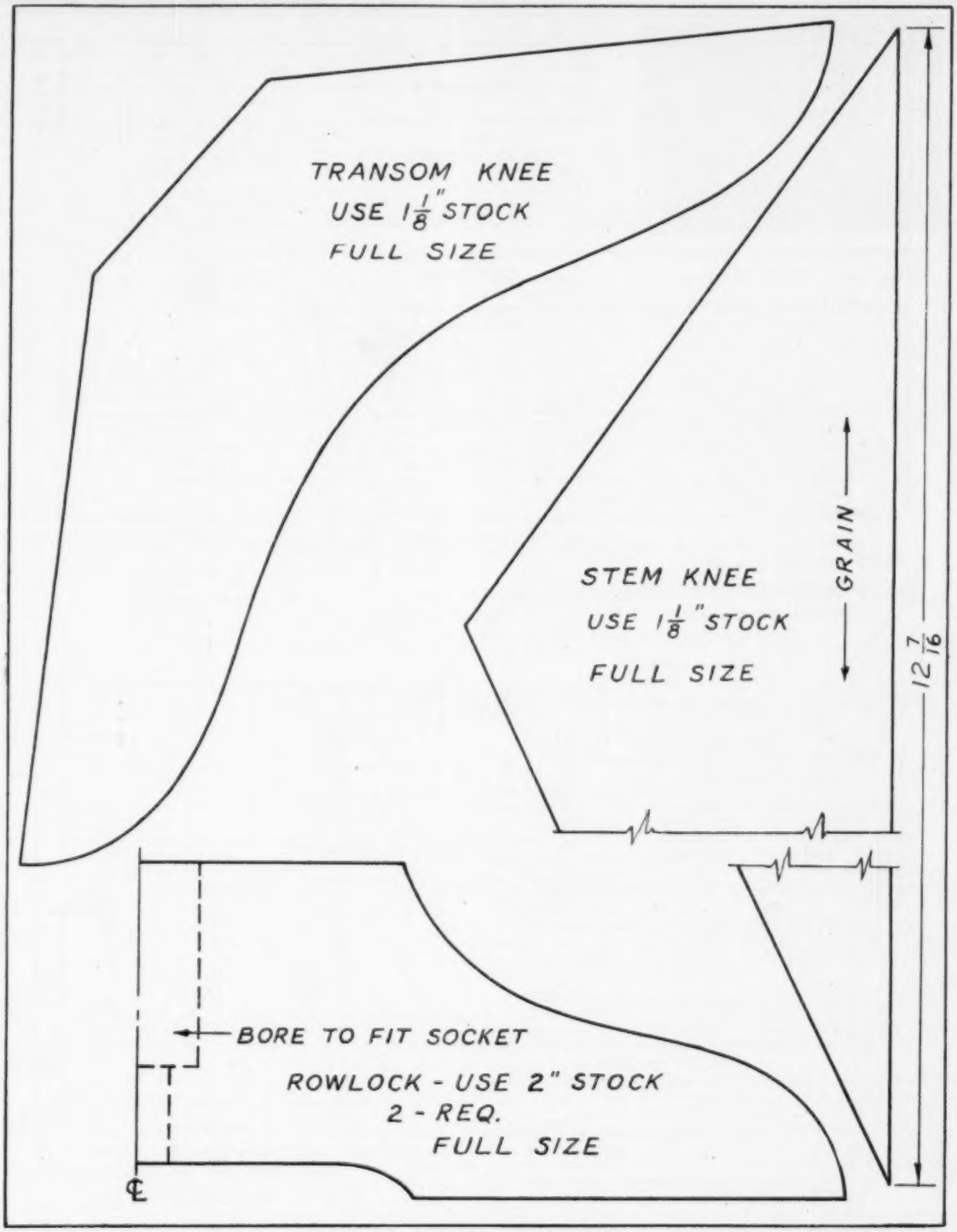
Covering Boards: These can be put on in two lengths, a 6-ft. length from the transom forward and a 3-ft. length to the joint with the decking. Clamp a 6-ft. length of the covering board to the sheer mold and coaming batten, commencing at transom. Mark outline, locate screw holes, remove, cut, drill screw holes. Coat sheer mold with caulking compound and fasten into place with No. 6 by ¾-in. screws spaced about 3 in. apart. Do likewise for the forward length and the opposite side.



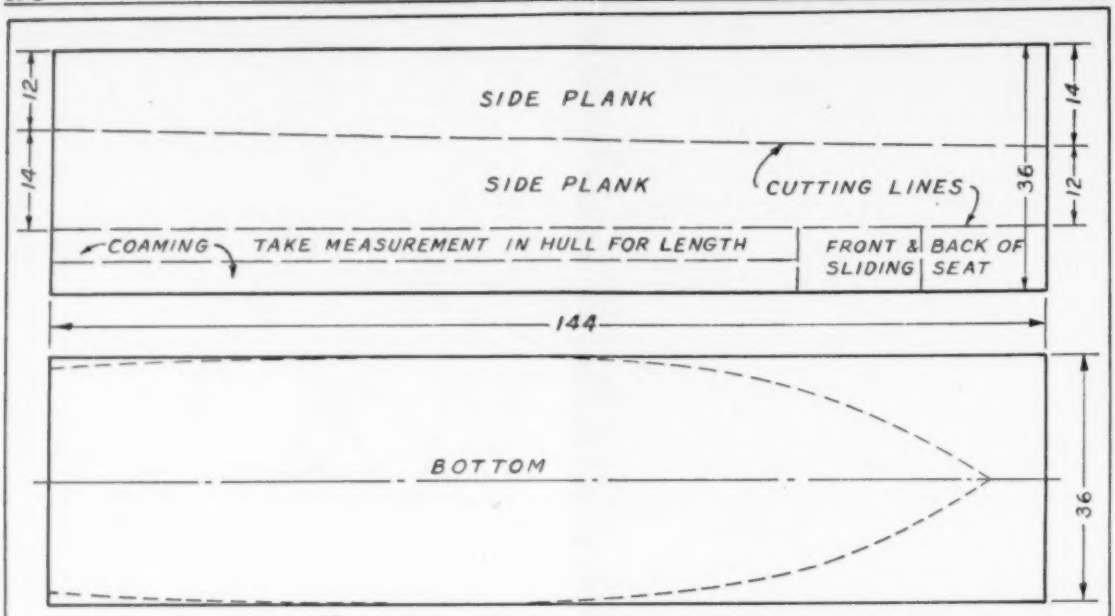
Finishing the hull



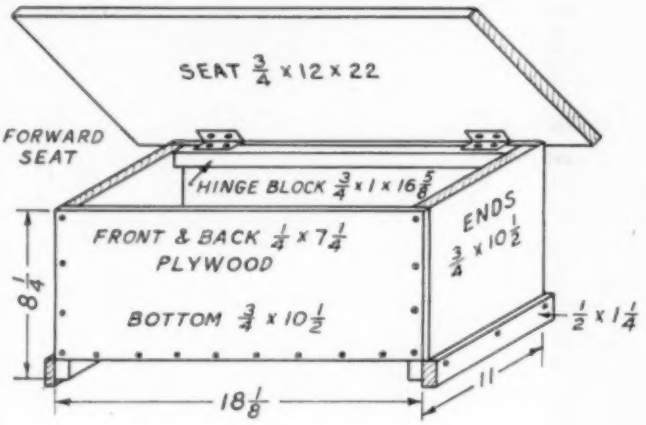
Figs. 12 and 13

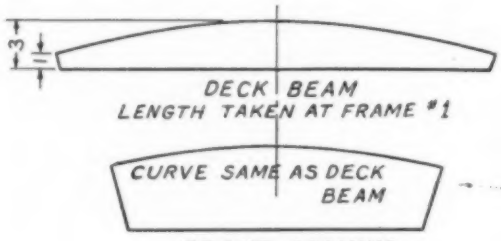


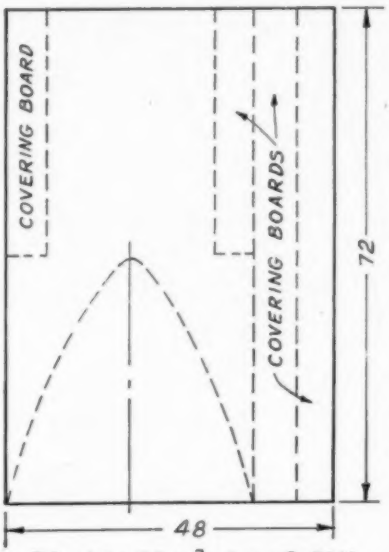
Stem and transom knees, and rowlock



2 PCS. 36 x 144 - $\frac{1}{4}$" 3 OR 5-PLY WATERPROOF PLYWOOD - BOTTOM & SIDES


SEAT $\frac{3}{4}$ x 12 x 22
FORWARD SEAT
HINGE BLOCK $\frac{3}{4}$ x 1 x 16 $\frac{5}{8}$
FRONT & BACK $\frac{1}{4}$ x 7 $\frac{1}{4}$ PLYWOOD
ENDS $\frac{3}{4}$ x 10 $\frac{1}{2}$
BOTTOM $\frac{3}{4}$ x 10 $\frac{1}{2}$
8 $\frac{1}{4}$
$\frac{1}{2}$ x 1 $\frac{1}{4}$
18 $\frac{1}{8}$
11





1 PC. 48 x 72 - $\frac{3}{16}$ 3 OR 5-PLY WATERPROOF PLYWOOD FOR DECK AND COVERING BOARDS.

Miscellaneous details

Coaming: Lay out and notch one end of the coaming strip to make a good tight fit on the transom. Clamp in place with the lower edge flush with the lower edge of the coaming batten. Mark and cut to length so as to make a tight fit with the deck beam. Some fitting may be necessary along the lower edge of the coaming to conform to the curve of the coaming batten. Scribe top edge parallel with the covering board and flush with top edge of transom. Remove and cut to shape. Apply caulking compound along coaming batten, clamp coaming into place and fasten with No. 6 by ¾-in. screws spaced about 4 in. apart. One No. 8 by 1¼-in. screw may be used at each frame. Remove any surplus compound that may squeeze out.

Front Coaming: Fit and cut the front coaming to insure tight joints with the side coaming. Clamp flush with bottom edge of deck beam and scribe top edge parallel and to the curve of the deck beam. Apply caulking compound to deck beam, clamp front coaming into place and fasten with five or six No. 8 by 1½-in. screws. This completes coaming and outlines the shape of the cockpit. Fasten ends of side coaming to transom and front coaming with several No. 8 by 1¼-in. screws.

Floor: So that the floor may be removable for cleaning and painting fasten the four ½ by 4-in. floor boards to the ¾ by 1½-in. cleats with equal spacing of floor boards. The cleats are 18 in. long. Use two No. 8 by 1¼-in. screws at each joint. Spread the cleats so one will fall at either end and one in the center. Two turn buttons can be made from scrap to hold floor fast to frames. The cleats should be located along bottom frame to hold floor board from sliding forward or backward. The top corners of the floor boards might be chamfered or rounded before fastening. Cut floor boards to length as desired.

Forward Seat: This seat may be made as suggested on the drawing with hinged cover, to make a fine dry storage compartment for lunches, shells, etc. It is not fastened but slides forward or backward along the floor or can be removed entirely. A fixed cross seat may be installed if preferred.

Rowlocks: Lay out and cut to shape from the 2-in. stock according to the full-size drawing. The full-size drawing may be cut out and traced on the stock. Bore the centers to fit the oarlock sockets. This should be a snug fit. Fasten sockets in place with screws. Screws may have to be purchased to fit the hole in the socket. Lay out the rowlocks on the covering boards into the center and over the filler blocks and as far forward as the filler blocks will permit. The center of the socket should be about 12 in. from the front edge of the forward seat. Fasten with four No. 12 by 2½-in. screws to each rowlock.

Sanding: Sand entire hull as required especially at various joints, etc. Round or soften all sharp corners. Use coarse paper first and fine to finish. On flat surfaces a sanding block should be used.

Painting: Brush and thoroughly clean to remove all shavings and dust. Prime entire hull. When dry, sand lightly with No. 00 paper and apply two finish coats. The oars should be painted along with the hull. Follow painting instructions as directed on paint container.

Oarlocks and Screw Ring: Locate positions of oarlock on oar so that handles will pass freely in rowing. Drill for oarlock pin. Two pieces of sole leather about 1 in. in diameter inserted between the oar and the metal will save wear on the oar. Insert pin and rivet ends. Drill into stem top or front as desired and turn in ring. The hunter and fisherman skiff is now ready for long years of rugged service.

Suggestions for the Use of Wood Screws

When joining two pieces of wood with wood screws it is necessary to drill a hole through the first piece, equal in diameter, to the shank of the screw in all woods. If the second piece is hardwood, then a pilot hole must be drilled into it. If it is softwood no hole is necessary when using small screws. The screw driver should fit the slot in the head of the screw snugly and should be of the same width as the head of the screw. It is important that the end and sides of the screw driver are flat. Use a bit of wax or soap as an aid in driving screws and to avoid the danger of the screw *twisting* off. In countersinking holes in plywood care must be taken to countersink just deep enough to permit the screw head to pull up flush with the surface.

SCHEDULE OF HOLE SIZES

No. 6 screw shank hole	9/64	Pilot hole	7/64
No. 8 screw shank hole	11/64	Pilot hole	9/64
No. 10 screw shank hole	13/64	Pilot hole	11/64
No. 12 screw shank hole	15/64	Pilot hole	3/16

RADIO DEMONSTRATION BOARD

EVERETT R. PASSOJA

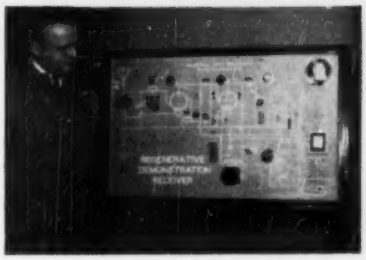
High School

Beaver Falls, Pa.

Here is a project that can be used effectively to demonstrate the function of a radio receiver. No particular type of circuit is recommended, since the availability of spare parts will govern the type to be constructed. In our particular case, we settled for a "blooper" which is a regenerative detector with one or two stages of audio amplification. No doubt, an old a.c.-d.c. midget would provide the parts for a better demonstration board, but oftentimes one hesitates to tie up too many parts in such a project.

At first, attempts were made to paint the diagram on the board, but a suggestion made by a fellow faculty member changed all this. Instead, the diagram was drawn, traced, blueprinted, and then pasted on the board. This method resulted in a really businesslike drawing that was pleasing to the eye, and technically correct.

The circuit design layout, regardless of what particular type is adhered to, is of the utmost importance. Tube types, component parts, etc., are all more or less standard. The same can be said of circuits. Let it suffice to say that it might be wise to make a full-size rough drawing, then place the parts on the drawing in order to assure adequate clearance between drawing and working parts.



The author and the demonstration panel

In this particular case, a plug in coil was used in order to increase the tuning range to the higher frequencies. By making a coil for the 80-meter amateur band, both a.m. phone and c.w. can be received, thereby adding to the effectiveness of this demonstration board.

With the performance of this board, excellent results have been obtained. While no claims are made for distant reception, local stations are received very well. This, in our estimation, is all that is required.

LANDING NET OR GAFF

OTTO A. NORTHQUEST and DONALD J. MICHALOWSKI

Pulaski High School

Milwaukee, Wis.

We are all living in an age where the "great out-of-doors" beckons all out-of-doors minded individuals. A check of boys will prove without doubt that most boys enjoy fishing. To be able to make at least some of the necessary equipment needed is a real challenge. Boys in our metal shop have found the project illustrated and described herewith very challenging and very interesting.

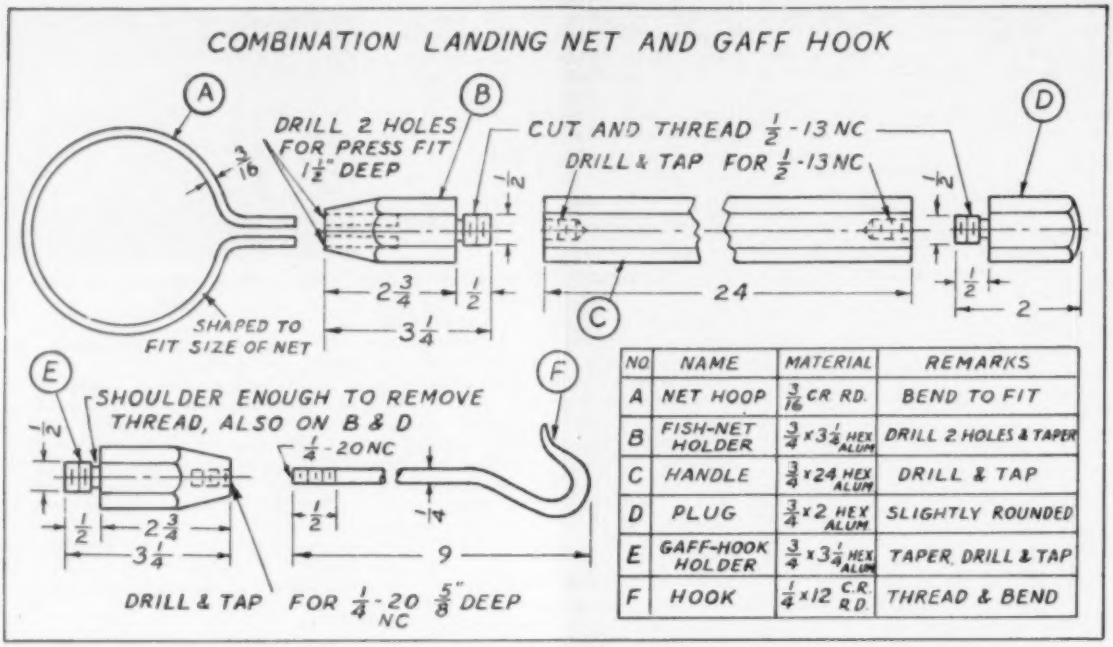
We usually start with the handle. This piece should be cut to length so that it will fit in the tackle box. Both ends are faced, drilled, and tapped. If possible, tap and drill these holes in the lathe.

Parts *B*, *D*, and *E* are machined, using the chuck. These parts should be drilled, tapped, and threaded in the lathe so that all threads are cut square.

The gaff hook is made from cold rolled steel. The tapered end is drawn out by forging, and then filed in the lathe, after which the hook is formed. The thread may then be cut with a die.

The landing net hoop is formed from 3/16 cold rolled steel. Be sure to purchase the net before making the hoop. Trace a circle on paper to fit the net opening desired and then proceed to form the circle. Do not anneal the steel unless the condition of the steel demands it. When the hoop is formed the ends are pressed into part *B*.

With the parts made, the landing net may be easily put together or taken down, or the



NO	NAME	MATERIAL	REMARKS
A	NET HOOP	3/16 CR RD.	BEND TO FIT
B	FISH-NET HOLDER	¾ x 3¼ HEX ALUM	DRILL 2 HOLES & TAPER
C	HANDLE	¾ x 24 HEX ALUM	DRILL & TAP
D	PLUG	¾ x 2 HEX ALUM	SLIGHTLY ROUNDED
E	GAFF-HOOK HOLDER	¾ x 3¼ HEX ALUM	TAPER, DRILL & TAP
F	HOOK	¼ x 12 C.R. RD.	THREAD & BEND

Combination landing net and gaff hook

net may be removed and the hook attached should a hook be desired.

This project is a challenge to make and a real pleasure to own.

PLANTER LAMP

DONALD SCHREI
Benson Polytechnic School
Portland, Ore.

The planter lamp, illustrated and described herewith, requires no special spinning equipment, but it gives the student a variety of work experience in layout, riveting, soldering, electricity, fabricating, threading, and welding. None of the operations are too difficult for the average student.

The lamp is made of brass, except the planter pan, which is made of copper of almost any gauge. The cost of the lamp may be reduced if it is made of galvanized iron and later painted.

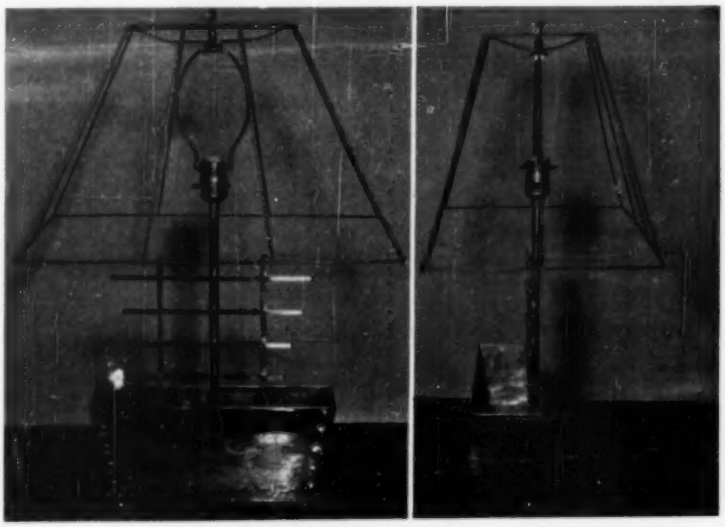
Planter Pan

BILL OF MATERIAL

No. of pcs.	*Material*	*Size*
1	Copper, brass, or galvanized iron	14¼ x 21⅜16

1. Lay out the pattern for the pan on the material.
2. Cut out the pan.
3. Draw file all radii smooth and remove file marks with emery cloth.
4. Drill for ⅛ by ¼-in. rivets using No. 31 drill.

NOTE: Drill only those holes indicated on the drawing.

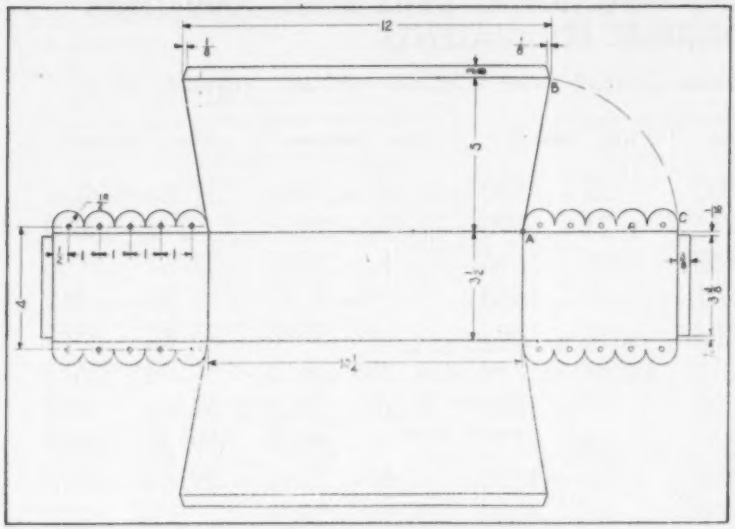


The planter lamp

5. Burr the holes using a drill at least twice the diameter of the holes.
6. Buff, while the piece is still flat, at least 2 in. down from the edges on the inside of the planter pan.

NOTE: Dirt will cover the inside of the pan up to within 1 in. from the top of the pan. If no buffer is available, glass, wax, or metal polish may be used.

7. Turn the ¾-in. hems on the edges so that they will be on the inside of the pan.
8. Form the pan on the brake or over a block of wood cut the same size as the bottom of the pan.
9. Clamp the pan in position to be riveted and drill the remaining holes.
10. Burr the holes and rivet the pan together.



Details of planter lamp pan

Trellis

BILL OF MATERIAL

No. of pcs.	*Material*	*Size*
2	Brass or steel rod	¼ x 11½ in.
1	Brass or steel rod	¼ x 10¼ in.
1	Brass or steel rod	¼ x 9¼ in.
1	Brass or steel rod	¼ x 8¼ in.
1	Brass or steel rod	¼ x 7¼ in.

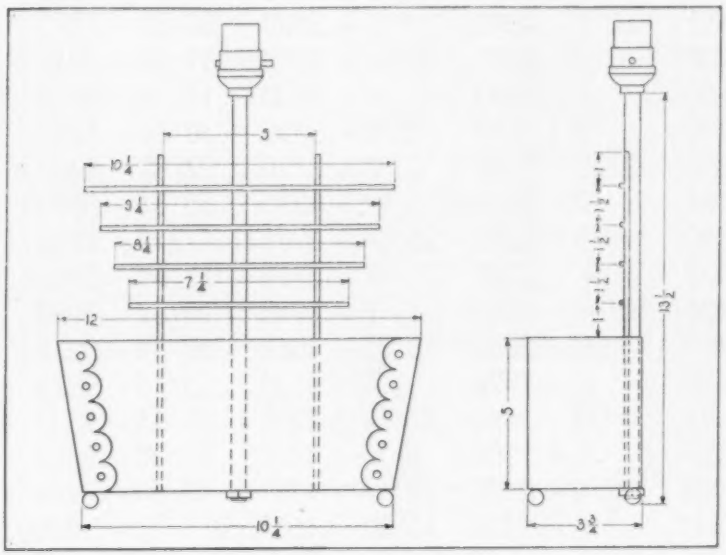
1. Cut the material to the proper lengths.
2. File the ends smooth and emery the file marks off.
3. Assemble by soldering or welding.
4. Buff or polish the trellis.

Lamp Stem

BILL OF MATERIAL

No. of pcs.	*Material*	*Size*
1	Galvanized iron pipe	⅛ x 13½ in.
1	Brass tube	½ x 13 in.
1	Socket	
1	Shade harp	8-in.
1	Pipe thread hex. nut	⅜ in.
10 ft.	Lamp cord and plug	

1. Cut the galvanized pipe to proper length.
2. Burr the inside of the pipe on both ends.
3. Thread the galvanized pipe for a length of ⅜ in. on both ends.



Details of planter lamp trellis

Assembly of the Planter Lamp

1. If plants are placed in the planter lamp that do not require much water, such as cacti, no soldering in the corners is necessary.
2. Drill a hole in the bottom of the planter pan for the lamp stem.

NOTE: The hole should be slightly larger than the galvanized pipe but not large enough for the brass tubing to slip through.

3. Solder steel ball legs to the four corners of the bottom of the planter.

NOTE: Brass ball finials may be purchased at any electrical supply house and substituted for steel balls.

4. Screw socket on end of lamp stem.
5. Complete assembly of the lamp stem and the planter by screwing hex nut tight to the bottom of the planter pan. Then tack-solder the stem to the back of the planter pan.
6. Solder trellis to the lamp stem.
7. Run light cord up through the center of the lamp stem and wire the socket.
8. Attach plug on other end of lamp cord.
9. Screw lamp harp to the socket.
10. Use glass wax or spray clear lacquer to all buffed parts.
11. If the student desires to make a shade out of ⅛-in. welding rod, the following dimensions may be helpful. Top of shade 4 by 8 in., bottom 11 by 18 in., 10 in. high. Shade may be covered with monk's cloth, burlap, or any other loosely woven material.

ANNOUNCE FOLDER ON JET RESEARCH

A new 4-page folder is available titled "Project Squid" that describes equipment and procedures developed and used in basic studies of pulse-jet engines by the Research Division of New York University College of Engineering.

Text material was prepared by George E. Hudson, professor of physics and technical director of the Squid Project at the College of Engineering. It explains how design of the pulse-jet engine is being analyzed so that functional knowledge can be formulated into theory. This work is aimed at facilitating further development of this type of jet engine, and is directed toward eliminating hazards and costly trial and error methods.

Folder contains photos of glass-walled flame tube and jet engine used in laboratory experiments along with high speed photographic records of flame patterns. Also shown is the full scale PJ-31 bust bomb engine with auxiliary test equipment that is operated by the Project at Westchester County Airport at Rye, N. Y.

Address requests for folder to V. W. Palen, Bureau of Public Information, New York University College of Engineering, New York 53, N. Y. Enclose 10 cents to cover cost of handling and mailing.

If I had to select the one characteristic which distinguishes a free country, I think I would say that it is a faith in the individual and a conviction that each of us has not only rights, but responsibilities. — *Benson Ford.*

NUMBER, LETTER, AND FRACTIONAL DRILL SIZES, AND THEIR DECIMAL EQUIVALENTS

DENHAM R. GRIFFIN—NICHOLS JUNIOR HIGH SCHOOL—MOUNT VERNON, N. Y.

Size Diameter	Size Diameter	Size Diameter	Size Diameter	Size Diameter
80 – .0135	50 – .0700	22 – .1570	G – .2610	31/64 – .4843
79 – .0145	49 – .0730	21 – .1590	17/64 – .2656	1/2 – .5000
78 – .0156	48 – .0760	20 – .1610	H – .2660	33/64 – .5156
1/64 – .0156	5/64 – .0781	19 – .1660	I – .2720	17/32 – .5312
77 – .0180	47 – .0785	18 – .1695	J – .2770	35/64 – .5468
76 – .0200	46 – .0810	11/64 – .1719	K – .2810	9/16 – .5625
75 – .0210	45 – .0820	17 – .1730	9/32 – .2812	37/64 – .5781
74 – .0225	44 – .0860	16 – .1770	L – .2900	19/32 – .5937
73 – .0240	43 – .0890	15 – .1800	M – .2950	39/64 – .6093
72 – .0250	42 – .0935	14 – .1820	19/64 – .2969	5/8 – .6250
71 – .0260	3/32 – .0937	13 – .1850	N – .3020	41/64 – .6406
70 – .0280	41 – .0960	3/16 – .1875	5/16 – .3125	21/32 – .6562
69 – .0292	40 – .0980	12 – .1890	O – .3160	43/64 – .6718
68 – .0310	39 – .0995	11 – .1910	P – .3230	11/16 – .6875
1/32 – .0312	38 – .1015	10 – .1935	21/64 – .3281	45/64 – .7031
67 – .0320	37 – .1040	9 – .1960	Q – .3320	23/32 – .7187
66 – .0330	36 – .1065	8 – .1990	R – .3390	47/64 – .7343
65 – .0350	7/64 – .1094	7 – .2010	11/32 – .3437	3/4 – .7500
64 – .0360	35 – .1100	13/64 – .2031	S – .3480	49/64 – .7656
63 – .0370	34 – .1110	6 – .2040	T – .3580	25/32 – .7812
62 – .0380	33 – .1130	5 – .2055	23/64 – .3593	51/64 – .7968
61 – .0390	32 – .1160	4 – .2090	U – .3680	13/16 – .8125
60 – .0400	31 – .1200	3 – .2130	3/8 – .3750	53/64 – .8281
59 – .0410	1/8 – .1250	7/32 – .2187	V – .3770	27/32 – .8437
58 – .0420	30 – .1285	2 – .2210	W – .3860	55/64 – .8593
57 – .0430	29 – .1360	1 – .2280	25/64 – .3906	7/8 – .8750
56 – .0465	28 – .1405	A – .2340	X – .3970	57/64 – .8906
3/64 – .0469	9/64 – .1406	15/64 – .2344	Y – .4040	29/32 – .9062
55 – .0520	27 – .1440	B – .2380	13/32 – .4062	59/64 – .9218
54 – .0550	26 – .1470	C – .2420	Z – .4130	15/16 – .9375
53 – .0595	25 – .1495	D – .2460	27/64 – .4218	61/64 – .9531
1/16 – .0625	24 – .1520	E – .2500	7/16 – .4375	31/32 – .9687
52 – .0635	23 – .1540	1/4 – .2500	29/64 – .4531	63/64 – .9984
51 – .0670	5/32 – .1562	F – .2570	15/32 – .4687	1 – 1.0000

SANDING BLOCK

E. A. RERUCHA

River Grove, Ill.

An efficient sanding block which does not require any other tools to load may be made with little effort as shown in Figure 1. A hardwood block is used and there are no metal parts projecting on the sides or ends to mar any work when sanding close to other members. A piece of felt may be used as a cushion between the paper and block if desired.

The block has a chamber in the form of a ⅞-in. diameter hole which will accommodate a 24-in. roll of paper 1¾ in. wide. The paper is clamped positively so that it cannot work loose by tightening the two wing nuts. To load, unroll about 7 in. of the paper and insert the roll in the hole from the side, at the same time putting the unrolled paper in the slot entering the hole. The sanded surface of the paper should be on top. Stretch the paper over the front and bottom and over the back and insert the end in the rear slot for a distance of about ⅜ in. Tighten the rear wing nut to clamp the paper. Now stretch the paper tightly by turning the roll in the hole so as to tighten the paper and clamp it by tightening the front wing nut.

Construction of the block is fully shown in the drawings. First, square the block and cut to shape. Drill the required holes and cut the slots. To keep the two clamping screws from turning when the wing nuts are tightened, two small brads are driven along the screw driver slots of each screw and bent over into the slot. Solder over the screw slots and brads and then file the surface smooth and even with the block surface. Sand the entire block and round all corners. Stain and paint as desired. Two No. 6 by 1½-in. f.h. wood screws reinforce the block between the hole and slot. Wing nuts may vary somewhat in size and it may be necessary to file the wings of the rear wing nut smaller so that it will fit into the counterbored hole.

LIST OF MATERIALS

1 Hardwood block 1¾ x 1¾ x 6
2 No. 6 x 1½ f.h. wood screws
2 Wing nuts No. 6–32
2 Washers for No. 6 screws
4 No. 18 by ½-in. brads.
1 No. 6–32 f.h. steel machine screw, 1¾ in. long.
1 No. 6–32 f.h. steel machine screw, 2 in. long

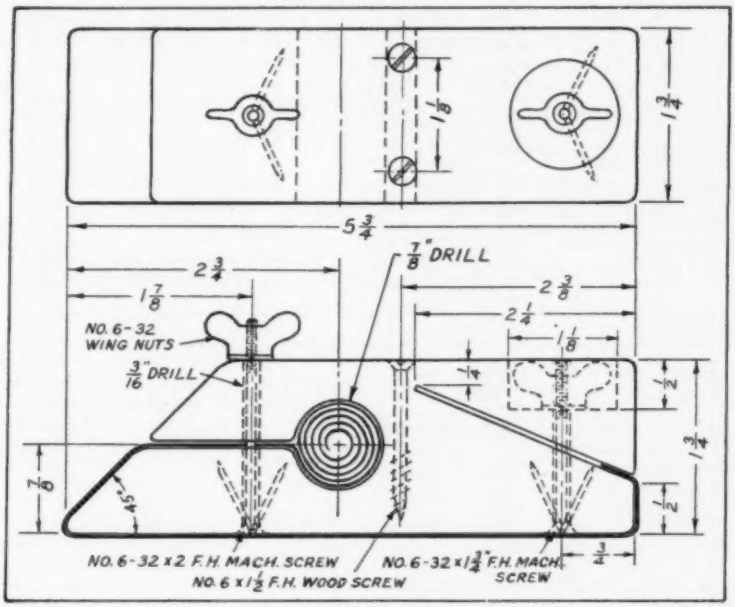


Fig. 1. Sanding block

CONSTRUCTING A SMALL DRILL PRESS IN THE SCHOOL SHOP

C. W. ILLINGWORTH

Racine, Wis.

The drill press described here has been used successfully as an easy-to-build project for the average school machine shop. There are no heavy castings with complicated work such as cutting gears and racks, and therefore, the project serves the needs of teachers having shops with limited equipment. The range of work gives practical experience on the drill press, lathe, and shaper. If a shaper is not available, the work may be done on the lathe. If the machine shop is equipped with a milling machine, it may be put to good use, especially if it is desired to develop a production job.

Because of the variety of relatively simple machine work and some benchwork, the building of this drill press may well fit into any planned course of machine-shop work or general metal for high school and vocational students. Student motivation is high, especially if the student may make the complete machine for himself. Adult evening school students particularly like such a project to work on. The utility value of a drill press for home use or as a first step in obtaining a much desired home workshop has been demonstrated many times since the development of small powered tools. Machines of this type are valuable for many uses in general metal shops, the sheet metal and electrical shops, and in the auto shop. The building of machines such as this drill press serves a twofold purpose in a school program; good and interesting training and utility for other departments if the machine is not sold to the student builder.

Simple drill press

This drill press will easily handle drills up to 5/16 in. with a ⅛ or ¼-h.p. motor, in either metal or wood. The table may be tilted and raised and lowered. The range may be increased by use of a longer steel post. Two speeds are provided and drilling up to 10 in. in diameter may be accomplished. Distance from center of drill to post is 5 in.

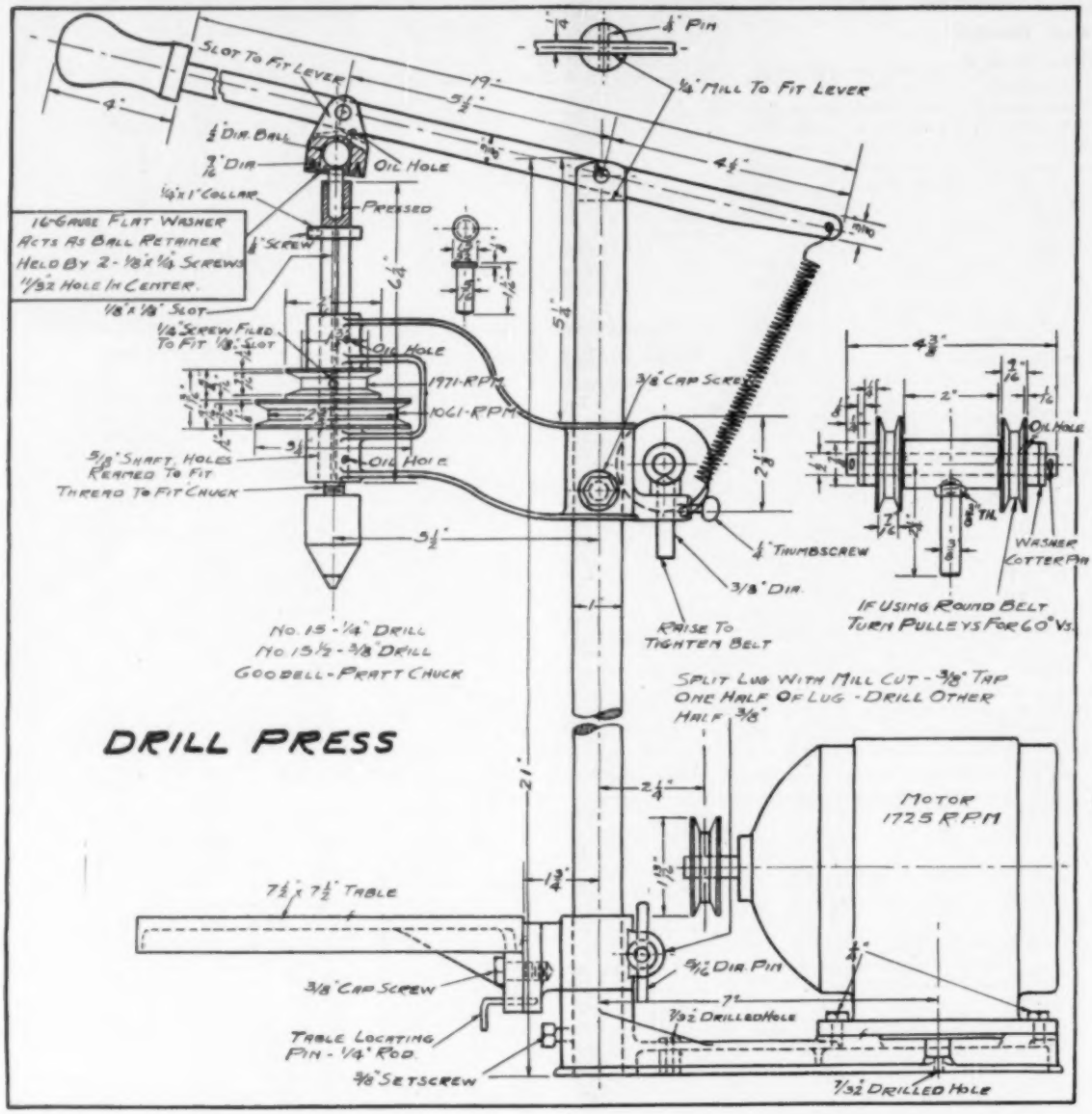
One of the special features is that there are no gears or rack to cut. Long life is assured through use of a ½-in. hardened ball for the thrust. With the overhead feed lever and toggle, ample leverage is provided for drilling. The completed machine is neat in appearance and practical. Its use as a project that can be built successfully in the school machine shop and in a reasonable period of time has been time-tested by the writer over a period of years.

Operations involved include drilling; reaming; lathe work between centers, in the chuck, and on the faceplate; flat shaper or milling machine work; shaping or milling at right angles; thread cutting on the lathe or with tap; and benchwork such as filing, fitting, use of the hack saw, assembling, and in one instance, hardening the small flange for the ball to ride on.

An outline of the operations to do the job follows. Operations may be varied to suit the shop conditions, needs of students, and the instructor's individual ideas.

Base

1. File or disk sand four motor surface pads.



2. Drill and tap four holes for ¼-in. machine screws in motor base pads.

3. Drill three holes 7/32 in. in dia. in base for wood screws to fasten machine on bench.

4. Drill or bore 63/64-in. hole in large boss for shaft, square with bottom surface.

5. Ream 1-in. hole.

6. Drill and tap for ⅜-in. setscrew in large boss at right angles to the 1-in. reamed hole. Setscrew locks shaft in 1-in. hole.

Table

1. Set up table casting on faceplate or shaper and machine true surface. May be disk sanded.

2. Mount machined surface to angle plate and faceplate to machine right angle end for clamping surface. Alternative: mount machined surface against true side of shaper vise jaw and machine at right angle.

3. Drill ⅜-in. hole in approximately the center of clamping edge flange.

4. Drill ¼-in. hole 5/16 in. from edge of flange. NOTE: This should be done after table-arm casting is machined. Table-arm matching surface should be clamped to machined surface of flange on table and with 1-in. hole of table arm lined up square with table surface. This ¼-in. hole is for a pin to locate the table surface exactly square with the shaft column.

Table Arm

1. Take machine cut on clamping edge of flange.

2. Bolt table arm casting to angle plate (machined surface to plate), mount angle plate to lathe faceplate, and bore 63/64-in. hole. Alternative: mount casting and angle plate

on surface of heavy drill press and drill to $^{63}/_{64}$ in.

3. Ream 1 in. to fit shaft column.

4. Clamp table arm to table and drill locater hole (described before).

5. While still clamped in same position, run ⅜-in. drill in hole already drilled in table flange to locate center for drilling $^{5}/_{16}$-in. hole.

6. Drill $^{5}/_{16}$-in. hole for ⅜-in. tap.

7. Thread hole with ⅜-in. tap. A ⅜-in. machine screw is used here to clamp table to table arm casting in the locked position desired, either square or at an angle.

8. Make vertical hack-saw cut or $^{1}/_{16}$-in. mill cut in side lug clear through to 1-in. hole, thus splitting the lug for clamping through use of tightener bolt.

9. Drill $^{5}/_{16}$-in. hole in center of lug and at right angle to slot.

10. Drill ⅜-in. hole in one half of lug in the $^{5}/_{16}$-in. hole.

11. Thread ⅜ in. with tap in other half of lug.

12. Make ⅜-in. bolt with shouldered head of ⅝ in. and ¾ in. long. The ⅜-in. threaded part should be 1 in. long.

13. Make $^{5}/_{16}$-in. dia. pin 2½ in. long. Drill hole in shouldered bolt head and press pin in place for cross handle.

Spindle Arm

1. Drill $^{63}/_{64}$-in. hole in large boss for shaft column mounting.

2. Ream this hole to 1-in. dia.

3. Drill and tap for ⅜-in. cap screw leading into 1-in. hole. (For lock screw to hold spindle arm firmly on shaft column.)

4. Mount casting on 1-in. stub shaft, clamp tight with ⅜-in. cap screw, and mount in drill press to drill and ream spindle hole exactly parallel with 1-in. reamed hole.

5. Drill $^{39}/_{64}$-in. true hole in center of spindle arm bosses, 5½ in. from center of 1-in. hole.

6. Ream ⅝-in. holes carefully to serve as bearing holes for spindle.

7. File or mill inner surfaces of bearing bosses for easy fit of two-step pulley.

8. Drill oil holes at angle shown.

9. Drill and ream ⅜-in. hole in boss near 1-in. hole for shaft mounting and adjustment of idler pulleys.

10. Drill and tap for ¼-in. thumbscrew to lock idler pulley shaft in position.

Spindle Shaft

1. Turn, file, and polish spindle shaft to ⅝-in. dia., or smooth running fit in ⅝-in. reamed bearing holes in spindle arm casting.

2. Turn threads in lower end of shaft to fit chuck selected.

3. Cut shaft in lathe to required length.

4. Shape or mill ⅛ by ⅛-in. slot full length of ⅝-in. dia. shaft for pulley key pin to ride in.

5. Drill $^{5}/_{16}$-in. hole 1 in. deep in end of shaft (opposite from threaded end) to press in short flanged ball rider stub.

6. Make 1-in. dia. ¾ in. thick stop collar with ⅝-in. hole in center and ⅛-in. tapped hole at side for locking screw.

Idler Pulley Assembly

1. Turn idler pulleys; drill and ream ½-in. hole in center of each.

2. Cut ½-in. dia. C.R.S. to 4⅜-in. length and drill end holes for cotter pins.

3. Turn two washers ⅛ in. thick, ⅞ in. dia. and with ½-in. holes to hold idler pulleys on shaft.

4. Drill ½-in. hole in idler assembly casting and face ends for 2-in. length.

5. Drill and tap ⅜ in. in boss in above casting.

6. Cut ⅜-in. thread on 2-in. length ⅜-in. shaft and screw into casting. Shaft is used as vertical post and for vertical adjustment of idler assembly.

7. Assemble idler pulleys, washers, and lock with cotter pins.

8. Mount idler assembly in place on spindle shaft.

Toggle

1. Drill $^{9}/_{16}$-in. with drill ground to 45 deg., ½ in. deep in toggle casting. This will house the ½-in. ball.

2. Mill, shape, or hack-saw ¼-in. slot in top of toggle for lever.

3. Drill ¼-in. hole in upper part of toggle at right angle to slot.

4. Make ¼-in. pin to fit this hole and to go through lever.

5. Make washer of 16-ga. iron, 1-in. dia. and with $^{11}/_{16}$-in. hole in center.

6. Clamp washer to flat end surface of toggle.

7. Drill two holes through washer and into casting for ⅛ by ¼-in. countersunk head screws. Tap ⅛-in. holes in casting. Two screws are to hold washer on toggle with ball thus held in place. Assemble after flanged pin shaft is made for insertion in top end of spindle shaft.

8. Make flanged pin shaft, over-all length 1¼ in. Turn flange on end to $^{15}/_{32}$-in. dia., and ⅛ in. thick. Turn balance of shaft to $^{5}/_{16}$-in. dia.

9. Assemble toggle and attach to upper end of spindle shaft as follows: slip washer onto flanged pin shaft. Press this shaft into upper end of spindle leaving about ⅛-in. clearance between end of spindle and washer, with washer held close to flange. Place ½-in. smooth ball in toggle. Screw washer to toggle casting with two ⅛-in. countersunk screws. Ball and hole should be packed with heavy grease.

Top Pressure Lever

1. Cut ¼ by ⅝-in. flat C.R.S. to length of 20½ in.

2. Lay out and drill three holes through the ¼-in. thickness; ⅛-in. hole, $^{3}/_{16}$ in. from one end. From this point mark 4½ in. for ¼-in. hole. Move up another 5½ in., and mark for ¼-in. hole. Drill holes.

3. From opposite end measure 1½ in. Lay out and file appropriate pointed tang for wood handle.

4. Make hardwood handle about 4 in. long. Drill for tang and drive onto lever.

Post Shaft

1. Cut 1-in. dia. C.R.S. to 21-in. length. This may be longer if desired.

2. Mill, shape, or hack-saw ¼-in. slot ⅞ in. deep on one end of shaft for easy fit of lever.

3. Round off this end of shaft.

4. Drill ¼-in. hole at right angles to slot, and $^{5}/_{16}$ in. from end.

Lever Pins

1. Cut two ¼-in. dia. C.R.S. pins ⅞ in. long. One of these is for holding the toggle to the lever and the other is to hold lever to post shaft.

2-Step Pulley

1. Turn larger diameter to 3¼ in., and smaller diameter to 2 in. Turn larger pulley to $^{9}/_{16}$-in. thickness and smaller to ⅝ in.

2. Cut V grooves. Inside width is $^{7}/_{16}$ in., and if for round belt, cut at 60-deg. angle. If V belt is desired, cut to appropriate angle. Depth of groove is $^{5}/_{16}$ in.

3. Drill and ream ⅝-in. hole in center of pulleys for sliding fit on spindle shaft.

4. Drill and tap for ¼-in. screw in bottom of groove of smaller pulley and through to ⅝-in. center hole.

5. File one end of ¼-in. screw to ⅛-in. thickness so it can slide in ⅛ by ⅛-in. key slot in spindle shaft. Place screw in position and file even with bottom of pulley groove.

Paint Castings

1. Paint all castings with gray machinery enamel and let dry.

Assemble Machine

1. Fit 1-in. post shaft into base casting and lock it in place with ⅜-in. setscrew.

2. Bolt table arm to table with ⅜-in. cap screw and place ¼-in. table locating pin in position.

3. Slide this assembly over post shaft and lock near bottom with shouldered ⅜-in. screw by turning cross pin.

4. Slide spindle arm casting over top of post shaft and lock 5¼ in. from top of post shaft.

5. Place 2-step pulleys in position; slide spindle shaft with its assembly of toggle and ball through from the top of spindle arm casting, through pulleys with pulley pin in slot.

6. Mount idler pulley assembly at rear of spindle arm casting, and lock it in place.

7. Place top pressure lever in top of post shaft and drive ¼-in. pin in place.

8. Place lever in slot in toggle and drive ¼-in. pin in place.

9. Attach expansion spring from back end of lever to idler pulley assembly.

10. Screw chuck on spindle.

11. Screw motor to base with four ⅛-in. cap screws.

12. Screw machine to bench with round-head wood screws.

13. Place belt over handle end of lever and on one of 2-step pulleys; over idler pulleys and motor pulley. Adjust idler assembly for proper belt tension and true riding.

14. Oil machine in appropriate holes.

15. Machine is now ready for use.*

*Castings and detailed blueprints for complete machining dimensions may be purchased from Designers Company, Racine, Wis.

SHOP KINK FOR CHECKING TAPERS

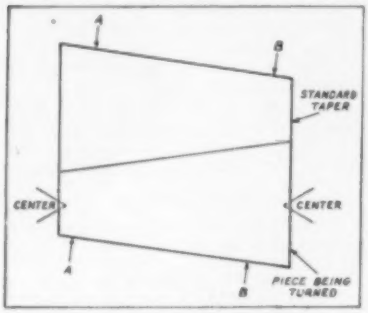
RALPH POPKIN
High School
Merrill, Ore.

When turning tapers on the engine lathe, the student must use one of three methods:

1. Offset the tailstock
2. Set the compound rest
3. Use a taper attachment

In any case, the fitting of the taper is necessarily a trial-and-error adjustment.

Having made the setup, a trial cut is made. To check the cut as to correct taper, the student places a duplicate master taper, in the form of a matching lathe center, next to the piece he has just cut with the large end



Turning tapers on the engine lathe

of the taper at the small end of the job. By checking with a micrometer at both ends of the tapers, the student will know what adjustments have to be made to complete the accurate turning of the taper. When he has the correct taper turned, the micrometer readings will be the same at both ends.

The ordinary method of fitting a taper is to fit it into a socket of the required size. This process takes considerably more time and often results in burring the inside of the sockets. In addition, the method just described can be used on the cylindrical grinder.

This method can also be used by the teacher for checking accuracy of students' work in taper turning.

I hope that this method of turning and checking tapers will be of as much use to shop instructors in teaching taper turning as it has been in my own experience.

INDIAN SILVERSMITHING

BEN HUNT
Hales Corners, Wis.

(Continued from page 296 of the September, 1949, issue)

Neckerchief Slides

Neckerchief slides are quite modern in Indian silversmithing, and are not often seen in the shop showcases, although when worn they never fail to attract attention. In scouting, neckerchief slides are standard equipment and are made out of almost anything to which a loop can be fastened. The slides

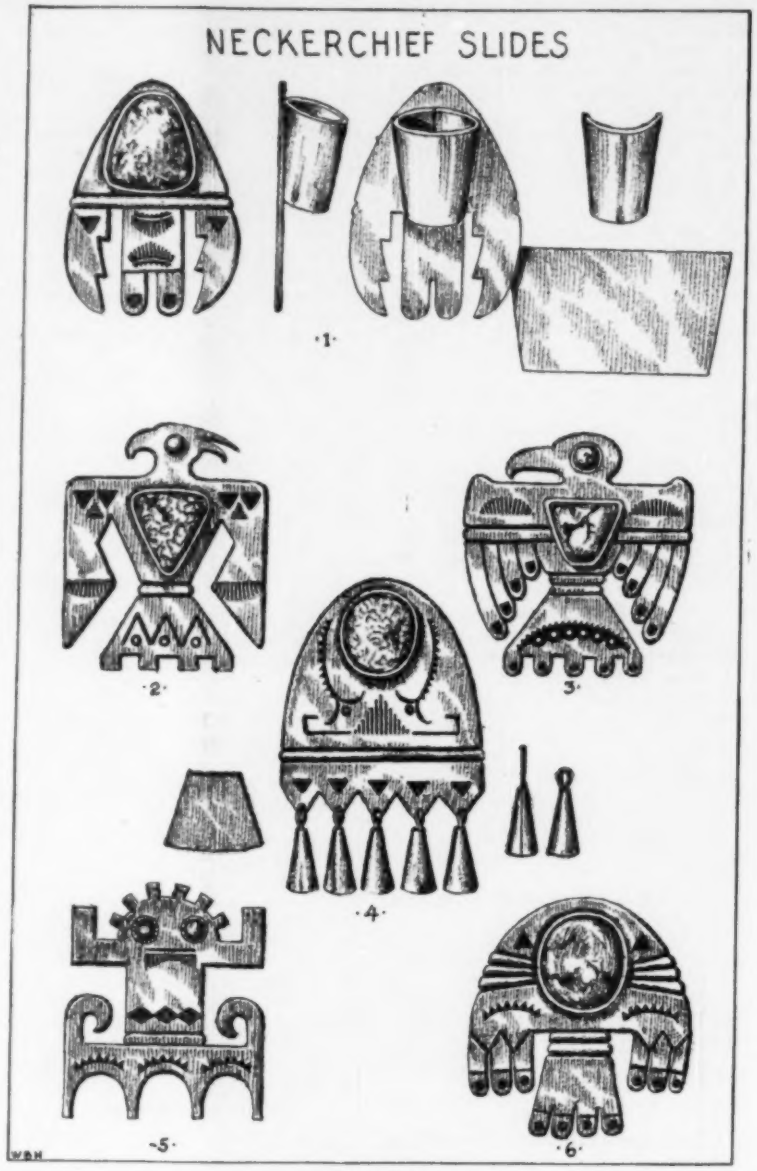


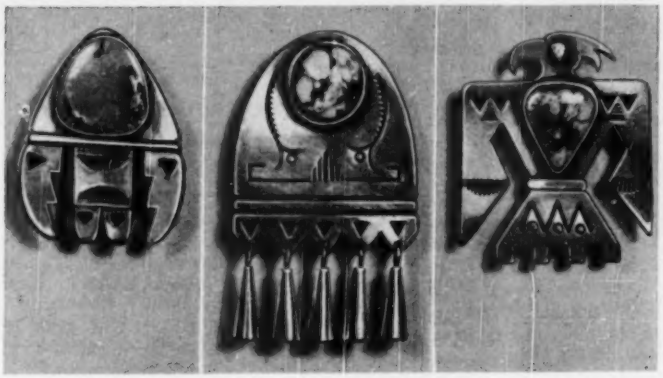
Plate 39

shown in this article have small loops and are used on the small triangular silk neckerchiefs and on regular neckties. They can, however, be made with larger loops, say ¾ in., to take the large neckerchiefs.

An easy procedure is as follows. Anneal a piece of silver and dip it in the pickle to whiten it. Then draw or trace the design onto the silver and do the stamping first, after which the design is sawed out with a jeweler's saw. In this way the lines in the design remain even, while they would probably spread if they were stamped after the piece was sawed out.

Plate 39: Figure 1, shows the construction of an Indian-made slide set with turquoise. It has a full round loop, but a half loop as shown at the right can also be used. Eighteen- or 20-ga. silver can be used for the front and 24-ga. for the loop. Figure 2 on Plate 39 has a raindrop for the eye, while Figure 3 shows a small turquoise.

Figure 4, in Plate 39, is an attractive slide requiring a little more work. The cone pend-



ants are cut out and shaped around a nail set with pliers and a hammer. Then the wire is inserted and the seam and wire are soldered on a charcoal block. The wire should then be bent in the shape of an eye, hooked in place on the slide, after which the eyes should be closed.

Figure 5 shows a slide without any turquoise.

Fig. 7. Made with bumped up half sphere and copper loop

In Figures 4 and 6 a half dome of sheet metal may be soldered on instead of using a turquoise. A twisted wire may be soldered around the edge of the dome. See Figure 7. Use a full loop on the slide shown in Figure 4 as the slide should hang a little forward to give the pendants a chance to hang free.

The loops can be made of copper if desired, especially when making several slides, as it is quite a saving.

Another idea, when no turquoise is available, is to use copper for the bumped up dome. In that case do not use the twisted wire as the solder may have a tendency to run up onto the dome. To prevent the solder from running up on the dome when soldering it to the flat section, file the bottom of the dome so it lies flat. File off the burr, but be careful not to file up on the dome. Flux the flat and lay the dome down on the wet flux. Then place small snippets of solder around the edge and apply the heat. It will be noticed that when the melting temperature has been reached the solder will flow in place without spreading onto the dome.

Wise management of the national debt is of vital importance to every American. In order to keep the debt widely distributed the Treasury Department is sponsoring the County Organization Plan for the selling of Savings Bonds in peacetime. Teachers form an integral part of this county organization.

ENGLISH FOR TRADE AND VOCATIONAL SCHOOLS

J. ALLEN MORRIS

Murray Vocational School

Charleston, S. C.

(See preceding articles in January, September, and November, 1948, and January, May, and June, 1949, issues)

Curing "ED" Trouble

One of the most common and most persistent errors in the work of vocational students is the omission of the letters "ed" on the past tense and past participial forms of regular verbs, writing sentences like these: "The Barracuda, a high-wing monoplane, which is *power* by a Rolls Royce Merlin engine, *has been describe* as 'the most unorthodox and versatile plane ever to take off from a flight deck' " and "General Greene *succeed* in the South because he *attack* the British at a number of different points." This is usually a deep-seated trouble, requiring a great deal of explanation by the instructor and much writing and concentration by the student before it can be eliminated. Within three years it can generally be cured.

The instructor should start remedial work on "ed" as soon as the first error appears, continuing the treatment until mistakes finally disappear. As the verb in each sentence is the key word, time spent on this work is not wasted. As I use the drill sheets on "ed" work, I teach rules of spelling, punctuation, and capitalization at the same time. The drills are so constructed that this is easy to do.

For the first error one block of a simple drill sheet, made up chiefly of sentences written by students, is used. The student follows the easy directions, and the instructor explains to him the mistakes made in his sentences. Each time he makes a mistake, he writes another block of Drill Sheet I, which contains six exercises:

Drill Sheet: ED Work

Directions: Rewrite the following sentences, adding *ed* to any verbs that need *ed* to show *past time*. In each sentence the time is *past time*.

I. (1) last week i receive your letter i enjoy it very much (2) we have move since i talk to you last month (3) just before the other car reach me i turn the wheel and avoid hitting it (4) during the storm last night john laugh at me for being frighten by the lightning (5) last Sunday we listen to jack benny s show and chuckle at the jokes (6) when we finish making the trailer last week we paint it dark blue (7) last Friday we start on another overnight hike (8) we reach the camp about 11 o clock (9) the old man had treat the dog cruelly (10) the man open the box carefully he look to see if there was a bomb in it

II. (1) the boy attempt to hit him with a brick (2) i have work all summer and i earn fifty dollars (3) two weeks after school close i start to work at the navy yard (4) the grounds are cover with large oak trees (5) i receive your letter last tuesday (6) it start to rain before the men finish their work (7) he pull the trigger but he miss the rabbit (8) they pick five bales of cotton yesterday (9) we haul six loads of dirt yesterday

III. (1) i hook a shark but he pop the line and escape (2) i row the boat for a while then my father row it and then we anchor and fish (3) we stay for about four hours but not a single fish nibble at the bait (4) whitney invent the cotton gin (5) the arrow kill the deer (6) after a while i got use to getting up early (7) we reach the clubhouse at five a.m. (8) time pass fast and nobody notice that the sun had disappear (9) she ask me for your photograph (10) she use to be pretty

IV. (1) i have receive all your letters (2) the girl almost drown (3) the pool close last week (4) a man ask me if i want a job (5) i wash dress and start for the show (6) ten soldiers volunteer to blow up the bridge (7) the bridge collapse when the bomb explode (8) he patch the sail (9) we round the buoy safely then we head for shore (10) when the boat had been repaint it look good

V. Get a copy of some magazine or book related to your trade and pick out 25 verbs ending in *ed*. Do not write the sentences. Simply make a list of the verbs which end in *ed*.

VI. Write 25 sentences, using the verbs written for block V. Make up your own sentences.

After a student has completed this drill sheet, he is ready for the next step. After a while he makes the same mistake again:

This time he is required to copy in his notebook the following chart:

"ED"

The two letters *ED* are added to a verb to show *past time*.

ED on a verb shows that the action of the verb is over — that it happen*ed* in the past.

Examples:

Yesterday he walk*ed* ten miles.
(past) (verb)

Last year he play*ed* basketball for
(past) (verb)
Murray.

After some words the *ED* is *not* used:

(to) He tried *to work* hard.
(did) *Did* he *play* baseball last year?
(can) He *can talk* very fast.
(could) They *could* not *finish* their work in time.

ED is not used after the following words:

Do — Don't — Does — Doesn't — Did — Didn't — Can — Can't — Could — Couldn't — Will — Won't — Would — Wouldn't — Shall — Shouldn't — May — Might — To.

Having copied the chart, the student then writes the sentences called for in block I; for the next mistake he does block II; and when the mistake again comes up in written work, block III of Drill Sheet II:

Drill Sheet II: "ED" Work

I. Use each of the following verbs in one sentence. (The *ED* on each verb means "past time" — that the action of the verb is over, finished.)

planned	happened	framed	changed	received
dropped	finished	proved	picked	worked
grabbed	repaired	moved	opened	talked
tried	believed	named	showed	looked
applied	equipped	wasted	fixed	seemed

II. Do not write any sentences with the following verbs. Add *ED* or *D* to each, forming its past tense:

call	like	ask	watch	report
hope	burn	taste	laugh	decide
jump	save	brace	learn	varnish
hike	turn	plane	start	discover
want	wipe	climb	follow	practice

III. *Directions:* Fill in the blanks with the *past tense* of the verbs. Write the sentences on your paper: (1) The man (try) to get a job. (2) The sailor (cry), "All ashore!" (3) The tenderfoot (tie) his knot wrong. (4) He (apply) for a job. (5) The banker (supply) the money. (6) Tom (drop) the wrench. (7) Bill (grab) the hammer. (8) We (plan) to go on a hike. (9) The traffic policeman (stop) the speeding car. (10) He (step) on a nail. (11) He (watch) the planes flying overhead. (12) They (open) the tool kit slowly. (13) Tom (look) under the workbench. (14) Harry (like) to go swimming. (15) The fireman (move) the ladder. (16) He had (finish) his work. (17) They were (call) upon to blow up the bridge. (18) Work was (start) early this morning. (19) His job was (check) carefully. (20) The door was carefully (open). (21) He (knock) at the door. (22) The surveyors (measure) the distance across the river. (23) The soldiers (talk) quietly. (24) John (thread) the pipe. (25) Everybody (work) hard.

By the time he has completed Drill Sheet II, the student is conscious that he should watch the ends of verbs. This is a good time to test his knowledge of verbs by giving him a page of printed material and having him pick out and write on a sheet of paper all the verbs he can find. If he obviously does not know how to find verbs, he should be referred to a good grammar book, in which he should be assigned enough work to teach him what verbs are and how they are used.

If, however, the student is able to pick out the majority of the verbs, he is probably just careless about checking his work. He simply glances at the first two or three letters of each word and does not read on to the end; hence he does not notice that he forgot to add the *ed*. In other words, he *reads* from his memory of what he meant to put on the paper, instead of reading what he actually wrote. If the instructor will explain this patiently several times to a student doing this, improvement in his written work will quickly follow. For this type of careless student, "make-up work" is essential. If, after he has done Drill Sheets I and II, he continues to write sentences like "Last year I *play* on the school team" or "Yesterday I *work* all day and I *was tire* last night," he should be required to write "I play*ed*," "I work*ed*," and "I was tir*ed* at least ten times each. As such mistakes recur, the number is steadily increased (10–25–50–100–250). Usually the errors stop before the 250 mark is reached.

Any student who needs more work than this should be told to make a list of operations used in his shop, using the past tense forms with "ed." When he has made a list of 25 verbs (repaired, fixed, soldered, taped, spliced, etc.), he should use each in a sentence. This can be done as often as necessary until the student eventually learns to be careful about using *ed* correctly in his written work. If still more work is necessary, additional drill sheets, similar to Drill Sheets I and II, can be made by typing blocks of shop-words sentences written by students.

In addition to teaching students to use *ed* properly, this work trains students to be more careful in their written work generally, gives them practice in checking work before turning it in, and improves their spelling, punctuation, and capitalization. It is well worth the time and trouble required to present it.

(To be continued)

ELEMENTARY AUTO MECHANICS

FRANK B. MILLER
Central High School
Tulsa, Okla.

(Continued from page 254 of the June, 1949, issue)

Assignment Sheet No. 51 — Wiring Starter Circuit

Why this is done:

The starter is the electrical device used to start the gasoline engine, and to give the starter the electrical energy which it requires, it is necessary to connect it with a battery with the proper type of cable.

Procedure:

1. Inspect starter switch to see that it has two nuts on the contact bolt, both of the proper thread.
2. See that the first nut is holding the contact bolt tightly in place on the switch.
3. Bolt the positive battery cable under the outer nut. Be sure to make a tight connection, but do not loosen the first nut holding the bolt in place.

CAUTION: In connecting a battery to a starter, always put the cables on the battery posts *last*, to avoid having *live* cable ends loose to short or ground, and also to eliminate danger of grounding the starter contact nut with the wrench which is being used to tighten it.

4. Bolt the negative cable to the metal of the motor or the frame at any convenient point, and then to the negative battery post.

Questions:

1. What is the result of loosening the first nut on the starter switch bolt? Using a nut with the wrong thread?
2. Why are large cables used to connect the battery and starter?
3. Why is a ground connection used instead of a second contact bolt on the starter?

Text reference: ....

Assignment Sheet No. 52 — Diagraming an Ignition Circuit

Why this is done:

In order to understand the operation of an ignition system, and also to be able to wire up that circuit on a motor, it is helpful to be able to picture the circuit while studying it.

Procedure:

1. Study the parts of an ignition system as explained in the text, and diagram each part separately.
2. Connect the separate units of the primary circuit with low tension wire as follows:

a) From positive battery post or live side of starter switch to battery side of primary coil winding.

b) From other end of primary coil to distributor breaker point contact post.

NOTE: If ammeter and ignition switch are used, they go between coil and distributor point, in series.

c) From insulated terminal of grounded condensor to distributor breaker point contact post.

3. Connect the secondary circuit with high tension wires as follows:

a) From secondary coil contact to center of distributor cap.

b) From side contacts of distributor cap to the spark plugs in proper firing order, starting from side contact nearest rotor, and following direction of rotor.

4. Study this diagram so as to be able to apply it in wiring a motor. See Assignment Sheet No. 57.

Questions:

1. What is the chief difference between high and low tension wires?
2. What becomes of the primary current when it leaves the ignition point?
3. Why does the high tension secondary current remain separated from the low tension primary current when they both use the ground for a return path?

Text reference: ....

Assignment Sheet No. 53 – Removing and Replacing Distributors

Why this is done:

In order to clean a distributor case, and in some cases in order to be able to remove the head or other parts of the motor, it is necessary to remove the distributor case.

Procedure:

1. Remove all wire connections and lift off the distributor cap and rotor.
2. Loosen the clamp holding the distributor case or shaft in place.

NOTE: On some motors this clamp is a bolt and split washer just under the distributor case. On others it is combined with the bolt controlling the hand spark advance range. On others, the case and shaft are together and held in by a setscrew in the side of the block holding against the shaft.

3. Lift out the distributor case and shaft.

NOTE: In some cases the shafts are separate, but can be lifted out when the case is removed.

4. Wash the distributor case out carefully with a small brush and kerosene.
5. Replace the distributor shaft and case, being sure the shaft is turned right for the gear teeth to mesh, and also for off-center cross pins to fit in slots.
6. Check distributor shaft motion to see that it revolved freely with the motor.
7. Tighten clamp locking distributor in place.

Questions:

1. Why remove the cap and rotor before lifting out the distributor?
2. Why are shaft pins off center?
3. What would happen if a distributor was not locked in place and the motor operated?

Text reference: ....

Operation No. 54 – Adjusting Distributor Points

Why this is done:

In order that the distributor points break the primary circuit effectively and at the same time remain closed long enough to build up for the next induction, it is necessary that they separate the correct specified amount when they open.

Procedure:

1. Select the ignition wrenches and thickness gauge.
2. Set the motor with the movable breaker point held on the peak of the distributor cam.
3. Measure the clearance to determine correction needed to permit gauge to just slip through the gap without wobbling.
4. If the stationary point is on the end of a small bolt, adjust by loosening the lock nut and turning the bolt.
5. If the stationary point is on a movable plate, adjust by loosening the plate lock screw and turning the eccentric adjusting screw.
6. Tighten the locking mechanism and recheck the clearance.

Questions:

1. What would result from too much point clearance?
2. What would result from too little clearance?
3. Why must point clearance be adjusted *before* a motor can be timed?

Text reference: ....

Assignment Sheet No. 55 – Timing a Single Point Ignition System

Why this is done:

For a motor to operate efficiently it is necessary to fire the fuel charge at just the right time with reference to cylinder and valve position.

Procedure:

1. Start piston No. 1 on the compression stroke by watching valves.

NOTE: The compression stroke of the piston starts just after its intake valve closes.

2. Bring No. 1 piston up to top dead center at the end of the compression stroke by turning over the motor the short distance necessary to *just close* the *exhaust* valve of the *last* piston of the motor, but not far enough to open the last intake valve.

NOTE: Examination of any motor with the head off will show that the first and last pistons of any motor are exactly together in position, but the valves will show those two pistons are exactly one revolution apart in the cycle. Hence, putting the last piston just at the end of its exhaust stroke and before intake by watching its valves, automatically puts the first piston at top dead center ready for spark. Top dead center can be found on a few motors, by holding a wire in a special timing plug hole provided directly above one piston; or by watching flywheel markings.

3. Place and hold hand control spark advance in center position.
4. Loosen distributor case clamp or distributor shaft clamp, as the case may be, adjust case or shaft until points are just ready to open, and retighten clamp.

NOTE: A thin strip of paper placed between the points will just slip loose the moment the points open.

Questions:

1. How can the intake valve be distinguished from the exhaust valve when finding compression strokes?
2. How do you know that compression follows the closing of the intake valve?
3. Why have the spark occur when the piston is up at the top?

Text reference: ....

(To be continued)

LATHE TABLE WITH ACCESSORY CABINET

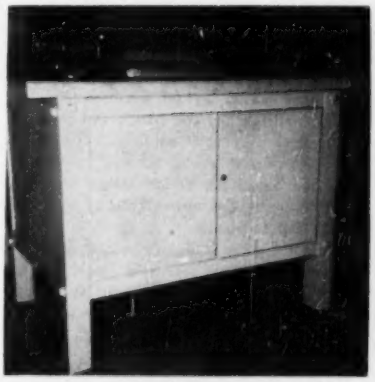
R. PAUL LIGHTLE
Industrial Arts Instructor
James H. Smart School
Fort Wayne, Ind.

This lathe table was built for school shop use. The cabinet was added as a convenience for accessories and as a timesaver for the instructor.

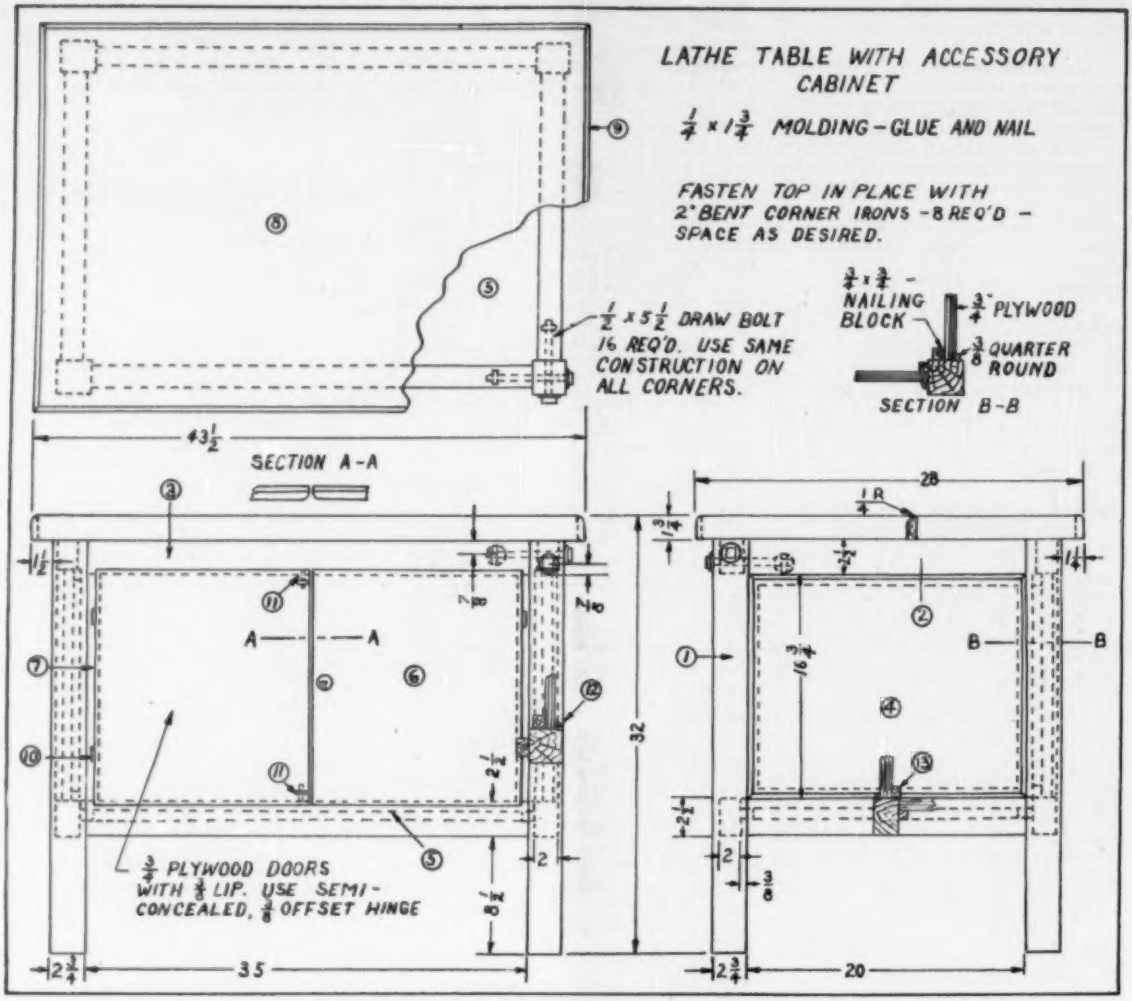
If the industrial-arts teacher is to teach habits of orderliness and planning he must set the example in his teaching. Someone has said that we teach more by example than through our various written directions. We have all seen shops where the teacher works against himself through lack of organization. The pupil cannot afford to spend his time running from work station to the toolroom and back again. Time wasted in this manner is lost for the pupil because he is losing mechanical skill which he might otherwise acquire if that time were used on the machine. We cannot afford to let this condition exist because it reflects upon the efficiency of our teaching. In our shop we feel that tools used on any machine should be located as physically close to that machine as possible. We also feel that tools should be checked at regular intervals and kept in A-1 condition. It was with these points in mind that this table was designed and built.

The following steps were followed in the construction of this piece of equipment.

Make the legs and rails of maple, cut and machine to proper size. Locate all bolt holes, drill with a 9/16-in. bit. Drill all nut holes in the rails with a 1-in. Forstner bit. Assemble the legs and rails. Glue and nail door stiles, part 7, in place.



Lathe table with accessory cabinet


LATHE TABLE WITH ACCESSORY CABINET
1/4 x 1 3/4 MOLDING — GLUE AND NAIL
FASTEN TOP IN PLACE WITH 2" BENT CORNER IRONS — 8 REQ'D — SPACE AS DESIRED.
1/2 x 5 1/2 DRAW BOLT 16 REQ'D. USE SAME CONSTRUCTION ON ALL CORNERS.
3/4 x 3/4 NAILING BLOCK
3/4 PLYWOOD
3/8 QUARTER ROUND
SECTION B-B
43 1/2
SECTION A-A
28
3/4 PLYWOOD DOORS WITH 3/4 LIP. USE SEMI-CONCEALED, 3/8 OFFSET HINGE
32
35
20

Details of lathe table with accessory cabinet

Cut the shelf, part 5, so as to fit snugly. Cut the nailing blocks for the shelf, glue, and nail in place. Fasten the shelf by toe-nailing into these blocks. Use 6*d*. finish nails.

Cut the back and end panels and assemble in the same manner as the shelf. Cut and nail the ⅜-in. quarter round, part 12, in place.

Locate the eight corner irons, fasten in place with flathead screws, No. 11 by ¾ in. Fasten top in place.

Make the doors and apply hardware.

Nail the molding, part 9, in place.

Apply one coat of flat white and two coats of Nile green enamel. (This color was used because it blends in with our school shop color scheme.)

Locate the lathe in its desired position on the table. Anchor with lag screws.

BILL OF MATERIAL

No. Req'd.	*Part No.*	*Name*	*Material*	*Size*
4	1	Legs		2¾ x 2¾ x 30¼
4	2	End rails		2 x 2½ x 20
4	3	Side rails		2 x 2½ x 35
2	4	End panels	Plywood	¾ x 16¾ x 20
1		Back panel	Plywood	¾ x 16¾ x ?
1	5	Cabinet shelf	Plywood	¾ x 20¾ x 35¾ approx.
2	6	Doors	Plywood	¾ x 17 x 17½
2	7	Door stiles		⅞ x 1½ x 16¾
1	8	Top		1¾ x 27½ x 43
	9	Molding		¼ x 1¾ x 14 ft. approx.
2 pr.	10	Semiconcealed hinges		
2	11	Elbow catches		
	12	⅜ quarter round, cut to fit,		24 ft. approx.
	13	Nailing blocks, ¾ square, cut to fit,		36 ft. approx.
16	14	Draw bolts ½ x 5½		
16		Washers		

PLEASE NOTE CORRECTIONS

Kindly add a note to Figure 3, page 321, and to Figure 10, page 323, in the October, 1949, issue, that 22-gauge SEC magnet wire should be used in both instances.

Also change the distance between the legs of the field frame shown in Figure 13, page 324, from 3¼ to 2¼ in.

Work injuries to 3,063,000 workers were reported in 1946, which means that over 47 million work days were lost to production and reconversion. The loss in time because of these accidents amounted to the work of 156,000 workers for one year. The 1946 figure was 2 per cent higher than that of 1945. — *National Safety Council.*

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Greater Job Flexibility

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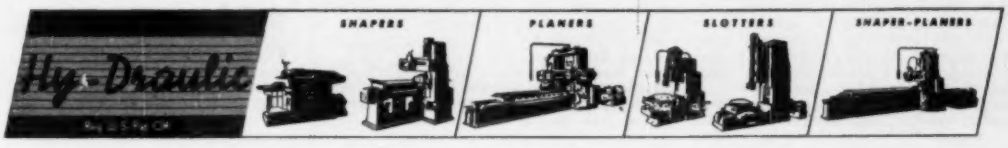

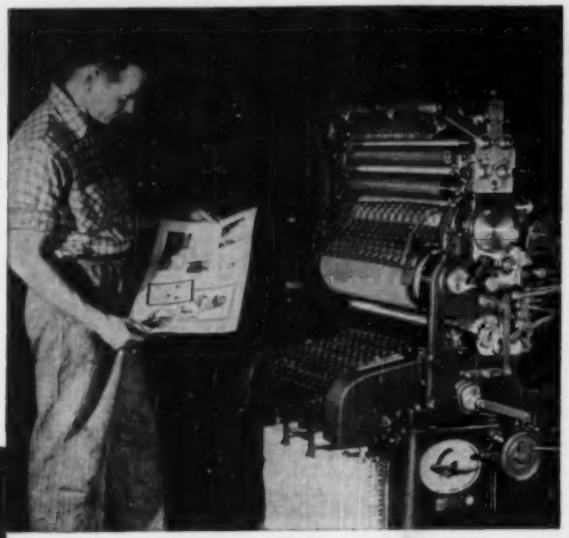

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Personal News

♦ Dr. Alfred G. Susie, chief chemist at Marbon Corporation, Gary, Ind., for the past four and a half years, has been appointed supervisor of plastics research at Armour Research Foundation of the Illinois Institute of Technology.

Dr. Susie will be in charge of research projects dealing with plastics in the chemistry and chemical engineering department of the Foundation, according to Dr. Louis Koenig, department chairman, who announced the appointment.

While at Marbon, Dr. Susie worked on rubber compounding, plastics, and rubber-to-metal adhesives. He holds five patents dealing with organic synthesis and wetting agents.

From 1939 to 1945 Dr. Susie was project leader for Esselen Research Corporation, Boston, Mass., where he engaged in chemical consulting work. From 1932 to 1936 he was a chemist at the Sun Oil Company, Toledo, Ohio.

Dr. Susie received his Ph.D. from Purdue University in 1939. He earned an M.S. from Toledo University and a B.S. from Ohio Northern University.

♦ Samuel G. Davey, 52, superintendent of schools in Eau Claire, Wis., for the past five years, died recently of a sudden heart attack.

He is survived by his wife, two daughters, and one brother.

Mr. Davey had been a prominent figure in the life of Eau Claire for many years. Before being appointed superintendent of schools in August, 1944, he had served as director of the Eau Claire Vocational School for three years. He was principal of Eau Claire high school from September, 1928, to September, 1941. He had joined the teaching staff of Eau Claire high school in September, 1920, as an instructor in chemistry.

Mr. Davey was a veteran of World War I.

♦ Chester A. Arents has been appointed assistant dean of engineering at Illinois Institute of Technology, Chicago, Ill.

Mr. Arents has been associate professor of mechanical engineering. He joined the staff in 1947, after serving a year as associate professor at Montana State College. From 1943 to 1946 he was assistant professor at Oregon State College.

He is a member of the American Society for Engineering Education, the American Association of University Professors, the American Institute of Electrical Engineers, and the American Society of Mechanical Engineers.

♦ George H. Fern has been appointed assistant director of the Education Department of the National Association of Manufacturers.

Mr. Fern is widely known in educational circles as a lecturer, administrator, author, and editor. Most recently he was with the U. S. Office of Education as a special consultant. For three years following the war he was managing editor of the *American Vocational Journal* and national director of the Scholastic Industrial Arts Awards.

Previously he was assistant state superintendent of public instruction in Michigan, a position to which he was appointed in 1936, and director of the Michigan State Board of Control for Vocational Education.

While serving in the latter post, in 1941 he was named Michigan state director for War Production Worker Training and state director of Food Production War Training. The final year of the war he served in the office of the Secretary of War as chief of the Training Branch, Civilian Personnel Division.

He is a past president of the National Association of State Directors of Vocational Education and a past vice-president of the American Vocational Association, second largest national education association in the United States.

A native of Michigan, Mr. Fern was educated in the Saginaw public schools and at the University of Michigan. He was graduated in 1929 with a B.S. degree in education from Texas A. & M., where he subsequently served as associate professor of industrial education.

From 1933 to 1936 he was Texas state director of industrial education, state director of adult education and chairman of the Vocational Education Division of the Texas State Department of Public Instruction.

The author of books and numerous magazine articles on education and industry, Mr. Fern also has served as a special lecturer in education at the University of Florida, University of Michigan, and Texas A. & M. College.

An important function of NAM's education department, of which F. Kenneth Brasted is director, is to bring about closer co-operation between education and industry and to encourage industrialists to give leadership and personal support to programs aimed at providing adequate compensation for teachers and better educational facilities.

♦ Raymond W. Phipps has returned from Korea where he served the United States Military Government as adviser in vocational education.

♦ Oakley Furney, former assistant commissioner of vocational education for the state of New York, conducted a course in the philosophy of vocational education at the summer session at the Montana State College.

♦ Dr. Robert Carey, director of guidance at Yonkers, N. Y., taught a course in educational vocational guidance at the summer session at the Montana State College.

♦ Howard E. Zieple was elected president of Alpha Rho Chapter (Johns Hopkins University), Phi Delta Kappa, men's national honorary fraternity.

(Continued on page 18A)

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- ✓ "Super-Safe" Blade Guard has basket that pivots with work so that blade remains covered but view is unimpaired. Guard tilts with blade.
- ✓ Welded steel cabinet encloses working parts.
- ✓ Saw arbor is carried on lubricated-for-life ball bearings.
- ✓ Motor mounting takes either Standard Delta or NEMA frame motor.

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- Compound angular cutting
- Grooving
- Dadoing
- Mouldings
- Angular cutting
- Rabbeting

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This 12" saw provides the kind of advanced engineering features that machine-tool users have come to expect from Delta. The panel at the left shows just a few of them.

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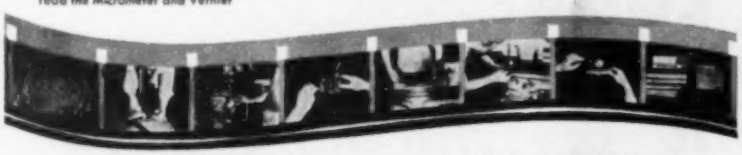

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PERSONAL NEWS

(Continued from page 16A)

♦ HERMAN E. WESTERBERG, instructor of social studies, General Vocational School No. 298, Baltimore, Md., was elected president of Beta Epsilon Chapter (University of Maryland) of Phi Delta Kappa.

♦ OSCAR LINDHOLM, Waukesha, Wis., founder of adult education at Waukesha, died at the age of 60 on September 21, 1949.

♦ RALPH T. CRAIGO, formerly assistant director of Dunwoody Industrial Institute of Minneapolis, Minn., is now conducting courses for vocational teachers in the state of Florida.

♦ MISS RUTH FREEGARD completed 28 years of service to Michigan schools as chief of the Homemaking Education Division in the Office of Vocational Education, on September 23, 1949.

Miss Freegard was born in St. Louis, Mo., and received her early education there. After graduation from the University of Chicago, she did graduate work at Teachers College, Columbia University, and received her masters from that institution.

Miss Freegard began her teaching career in the elementary schools in her home city where she also began her work in homemaking education. Later she taught at the University of Colorado and at Iowa State College, where she held an associate professorship, preceding her coming to Michigan. She served on numerous committees of state and national organizations of education and of home economics; has been adviser to the Michigan Home Economics Association for 25 years; and was a vice-president of the American Vocational Association for four years. She also was a member of the Board of Michigan Congress of Parents and Teachers for nine years.

♦ CONRAD WHITE, formerly graduate assistant in agricultural education at Michigan State College, recently joined the staff of the Office of Vocational Education replacing Mr. Kerrey as supervisor of Veterans' Institutional On-Farm Training.

♦ HOWARD B. GUNDERSEN, president of the Salt Lake Area Vocational School, left for Germany, July 7, 1949, to assist the Overseas Affairs Branch, U. S. Office of Military Goverament, in developing vocational education in Germany.

♦ HARRY C. SCHMID, state director of vocational education in Minnesota, has returned from Germany after finishing his assignment for the United States Office of Military Government.

♦ H. C. FETTEROLF, chief, agricultural education for Pennsylvania, has left for Germany to study the current progress in vocational agricultural training.

♦ CLYDE A. BOWMAN, The Stout Institute, Menomonie, Wis., has again participated as a judge in the Annual Industrial Arts Fair, held in the Museum of Science and Industry in Chicago on August 1, 2, and 3, 1949. He was a member of the judging team for plastics and woodworking.

♦ PHILIP VAN WICK taught "Philosophy of Vocational Education" in the summer session workshop at Idaho State College, Pocatello, Idaho.

♦ ANDREW C. LUFF of Detroit, Mich., was appointed to the position of assistant professor of industrial education at Western Michigan College, Kalamazoo, Mich.

Mr. Luff formerly taught at the Chrysler Corporation Apprenticeship School. His educational work was taken at Wayne University, Detroit, Mich. He is teaching electricity and shop mathematics in his present position.

♦ B. A. HARDAWAY, instructor of engineering drawing at the Texas A. & M. College, received his M. of Ed. degree in Industrial Education from the same institution in the summer of 1948.

♦ D. R. ROBERSON, instructor of engineering drawing at the Delmar Junior College, Corpus Christi, Tex., received the M.Ed. degree in Industrial Education from the Texas A. & M. College in July, 1948.

♦ WILLIAM T. MCGREGOR, B.S. degree from Texas A. & M. College, is head of the trade and industrial department at the West Texas State Teachers College at Canyon. He was formerly co-ordinator of the Cooperative Part-Time Education program in the Tyler, Tex., public schools.

♦ GORDON A. MOORE, B.S. degree from Texas A. & M. College, recently accepted a position as instructor of refrigeration, and coach of basketball, at the Junior College at Laredo, Tex.

♦ HOWARD S. PERRY, B.S. from Texas A. & M. College, and a graduate student during summer terms, is industrial-arts teacher at the Brenham, Tex., high school.

♦ E. L. PULLEN, B.S. degree from Texas A. & M. College, is instructor of industrial arts at Jones County Junior College, Ellisville, Miss.

♦ CLYDE A. BOWMAN, dean of industrial education, and RAY WIGEN, director of graduate studies, The Stout Institute, Menomonie, Wis., were co-chairmen of the bulletin, "Philosophy and Objectives for Industrial Arts in the Wisconsin Schools," recently published by the Wisconsin Industrial-Arts Curriculum Committee.

♦ BILLY J. ARMSTRONG, formerly head of the industrial-arts department at the Jones County Junior College, Ellisville, Miss., has been appointed instructor of woodworking at the North Texas Agriculture College, Arlington, Tex.

♦ A. J. BOHUSLAV, who received his B.S. degree from Texas A. & M. College, has accepted the position of instructor of industrial arts in the high school, Boling, Tex.

♦ JAMES L. BOONE received his M.Ed. in Industrial Education from the Texas A. & M. College in June, 1948. He is supervisor of industrial education in the Laredo Junior College, Laredo, Tex. During the 1948 summer months, he served as an industrial teacher trainer for the Texas State Board of Vocational Education. He also

(Continued on page 20A)

Good News for School Shop Budgets

AMMCO model 2600 and 1600 Combination for Wet Honing

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PERSONAL NEWS

(Continued from page 18A)

served as a graduate assistant while pursuing his master's degree.

♦ WILLIAM A. BURDETTE is a member of the staff at the Laredo Junior College, Laredo, Tex., as a general metal teacher. He received his B.S. in 1948 from the Texas A. & M. College.

♦ TRUMAN T. ISBELL received his B.S. degree from Texas A. & M. College and is now a member of the faculty of the Jones County Junior College, Ellisville, Miss., as an industrial-arts teacher.

♦ O. D. LOFFER, B.S. degree from Texas A. & M. College, is now teaching industrial arts at the Hernando Consolidated Schools, Hernando, Miss.

♦ JAY W. PICKETT was appointed district sales manager by E. C. Atkins and Co., Indianapolis, Ind. He will be in charge of the southeastern district, with headquarters at Atlanta, Ga.

♦ W. MORRIS JONES, supervisor and instructor of metalwork and mechanical drawing at the Senior High School, East St. Louis, Ill., retired from teaching at the end of the school year in June.

♦ R. M. CATCHIGS, who has taught for more than thirty years in the industrial-arts department of the Houston Colored Public Schools, retired in June of 1948.

♦ J. ARTHUR LEWIS, instructor of mathematics at Middlesex County Vocational and Technical High School, at Perth Amboy, N. J., was appointed assistant principal of his school.

♦ Holger E. Holmen, formerly industrial-arts teacher at Duluth, Minn., has been appointed instructor of industrial arts at Waldorf College, Forest City, Iowa.

He received his master's degree in industrial education at the University of Minnesota, August 25, 1949.

♦ Ralph N. Campbell, director of extension, opened the third annual conference of plant training directors sponsored by the New York State School of Industrial and Labor Relations at Cornell University on July 7, 1949. The theme of the conference was "Evaluating Industrial Training Programs."

♦ FRANK J. ASCHENBRENNER and EARL C. CLARK have been appointed assistant directors of research and engineering, Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.

Mr. Aschenbrenner will be in charge of the Air Reduction Murray Hill, N. J., laboratory. Mr. Clark has been placed in charge of the development and engineering groups.

♦ J. K. HAMILTON has been appointed manager of apparatus research division, Air Reduction Sales Co., New York City. H. O. KLINKE has been made assistant manager; J. T. MCKNIGHT superintendent of production and services section; and T. J. CHOLIS, supervisor of patent section. These men are all on the staff of the Air Reduction research laboratory located in Murray Hill, N. J.

♦ LAWRENCE S. WRIGHT of Menomonie, Wis., formerly instructor of drawing in the University of Missouri, has joined the industrial-arts staff of the Iowa State Teachers College, Cedar Falls.

♦ GEORGE SENTENEY of Carbondale, Ill., formerly instructor of mechanical drawing in the University of Missouri, has accepted a job with the Duluth branch of the University of Minnesota at Duluth.

♦ WALTER J. ROBINSON has returned to his position as head of the department of industrial education at Northwestern Louisiana State College, Natchitoches, after spending a year in graduate study at the University of Missouri.

♦ DR. PAUL R. TRUMPLER of Olean, N. Y., has been appointed professor of mechanical engineering at Illinois Institute of Technology. He will be in charge of the machine design division in the mechanical engineering department at Illinois Tech.

♦ SAMUEL E. RUSINOFF, assistant professor of mechanical engineering at Illinois Institute of Technology, has been promoted to the rank of associate professor of manufacturing processes.

Mr. Rusinoff, who has been associated with Illinois Tech's mechanical engineering department since 1939, is a graduate of Cooper Union Institute of Technology where he also earned an M.E. degree in 1927.

♦ WILLIAM R. TAAFFE has been appointed associate professor in the Carnegie Institute of Technology Department of Industrial Administration effective September 1.

Prof. Taaffe is a graduate of the New York University Law School and has been assistant personnel director for the Manning, Maxwell and Moore Heavy Equipment Corporation.

♦ JOHN GEORGE MILLER, of Playa del Rey, Calif., recently completed an assignment in Germany for the U. S. Office of Military Government for Germany, Education and Cultural Relations Division.

♦ E. E. ERICSON, professor of industrial arts, Santa Barbara College, University of California, is planning a nationwide trip for the coming academic year. Prof. Ericson will visit a large number of the institutions offering teacher education programs in industrial arts, as well as city school systems and state offices where industrial-arts supervision is carried out, and curriculum planning accomplished.

♦ MAURICE M. RICHARDS of Ypsilanti, Mich.; OTTO H. HEJKAL of Memphis, Tenn.; JACK MORGAN of Pittsburg, Kans.; joined the staff of the University of Missouri as part-time teachers of drawing while they pursue graduate work leading toward the doctor's degree in Industrial Education.

♦ E. W. FOWLER of Eastern Illinois State College, received his doctor's degree in industrial education from the University of Missouri in

(Continued on page 23A)

ELECTRIC HEAT assures accurate control over Wide Temperature Range

● Inspecting ware fired by Harper electric kiln equipped with GLOBAR non-metallic heating elements at the New York State College for Teachers. An average of 150 student teachers per year receive instruction under the direction of Mr. Edgar Strong.

Training student teachers in various types of ceramic firing places unusual demands on kilns. Temperature control must be quickly adaptable to a variety of firing problems. Uniform work chamber temperatures are necessary to insure accurate and dependable results. That's why the New York State College for Teachers at Buffalo selected kilns equipped with GLOBAR silicon carbide heating elements for their Industrial Arts Teacher Training Program.

In conducting a program of this type, kilns equipped with GLOBAR elements offer several important advantages. Operation at a high temperature is safer. There are no explosion or fire hazards. It's cleaner and quieter. Dirt and fumes are avoided. Expensive exhaust systems are unnecessary. The compact kiln structure occupies little space. It is easily and quickly installed. Low maintenance costs are kept at a minimum through the long dependable service provided by GLOBAR heating elements.

Electric kilns equipped with GLOBAR heating elements are in operation in leading vocational schools, high schools, colleges and universities throughout the country. The many advantages offered make their application well worth considering. For further information on installation and operating details, write Dept. Y-119, The Carborundum Company, GLOBAR Division, Niagara Falls, New York.

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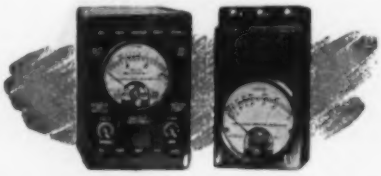
COMPACT TEST EQUIPMENT FOR CLASSROOM USE



Volt-Ohm-Milliammeter (Model 697)—Contains carefully selected group of ranges to cover a wide variety of electrical measurements. Compact, light weight, and low in cost.

Ohmmeters (Model 689)—Available in two, double range instruments . . . 0-10 and 0-1000 ohms full scale; and 0-5000 and 50,000 ohms full scale. Compact, rugged and low in cost.

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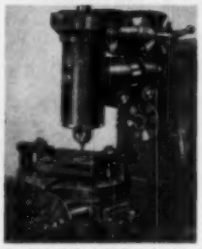
Marvin Machine Tool Attachments are ideal tools for school instruction purposes. They allow more students per class, do not increase floor space, and are most versatile. Let us prove it to you!

MARVIN ROTARY INDEX TABLE takes guess work out of setting split graduations; it's indispensable to your milling machine, shaper, drill press and surface grinders. This table has a hardened and ground worm; 40:1 ratio, locks from the bottom, will not tilt. With *three index plates, each having 6 sets of holes,* indexing is *simple, fast, accurate, positive.* Nothing can beat a MARVIN Rotary Index Table. Price $93.00 F.O.B. Factory.



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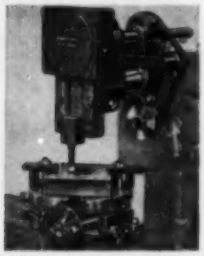

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PERSONAL NEWS

(Continued from page 20A)

June, and has returned to his regular position in Illinois.

♦ M. Ray Karnes of the University of Illinois was a member of the staff in the department of industrial education at the University of Missouri during the 1949 summer session.

♦ George J. Andrews has been appointed instructor in mechanical engineering at Illinois Institute of Technology, Chicago, Ill.

♦ Lee S. Whitson, chief industrial engineer at the Minnesota Mining and Manufacturing Company, St. Paul, was appointed professor of mechanical engineering at the University of Minnesota by the University's Board of Regents at their meeting on July 8 at Crookston. Mr. Whitson took over his new position September 16.

Association News

♦ The New Jersey Vocational and Arts Association will hold its regular fall meeting at the Hotel Haddon Hall in Atlantic City, N. J., on Saturday, November 12, 1949. The day's program follows:

10:00 a.m. — Haddon Hall Hotel, Viking Room, main floor. Chairman, Dr. Albert E. Jochen, president. "Recent Accomplishments of Vocational and Practical Arts Education in New Jersey," by John A. McCarthy, assistant commissioner, vocational division, state of New Jersey; "Criteria for the Evaluation on Vocational Education," by S. Lewis Land, head, department of industrial education, The Pennsylvania State College, Pennsylvania.

12:00 noon— Haddon Hall Hotel, Mandarin Room, main floor, N.J.V.A.A. Council Meeting and Luncheon.

2:00 p.m.— Haddon Hall Hotel, Viking Room, main floor, N. J. Industrial Arts Association Meeting. Chairman, Armand G. Rehn, president. "Jewelry Making and Gem Cutting," by William T. Baxter, industrial-arts teacher, Washington, D. C., author of *Jewelry, Gem Cutting and Metalcraft*, and co-author of *Woodworking Projects and Upholstering* — Richard O. Harthmann, secretary.

♦ Officers for the school year 1949–50 for the Peninsula Industrial Education Club of Virginia are as follows: president, Cecil H. Erickson; vice-president, Leroy F. Moore; secretary, Sam Kerr; and treasurer, John W. Joyce.

♦ Officers for the school year 1949–50 of the Wyoming Vocational Association are as follows: president, Robert Bishopp, Powell, Wyo.; and secretary-treasurer, Katherine Keisling, Lovell, Wyo.

♦ The Pennsylvania Industrial Arts Teachers' Professional Association, Allegheny County Branch, held their first meeting of the 1949–50 school year at Pittsburgh, Pa. Dr. Shriver L. Coover, director of industrial arts, State Teachers College, California, Pa., was the speaker.

♦ Officers for the school year 1949–50 for the West Virginia Branch of the A.V.A., are: president, Mrs. Marie Kittle, Philippi, W. Va.; secretary-treasurer, Dwight Fowler, Washington Irving High School, Clarksburg, W. Va.

♦ The major science teaching societies affiliated with the American Association for the Advancement of Science will hold a second series of joint meetings in New York City, December, 27–30.

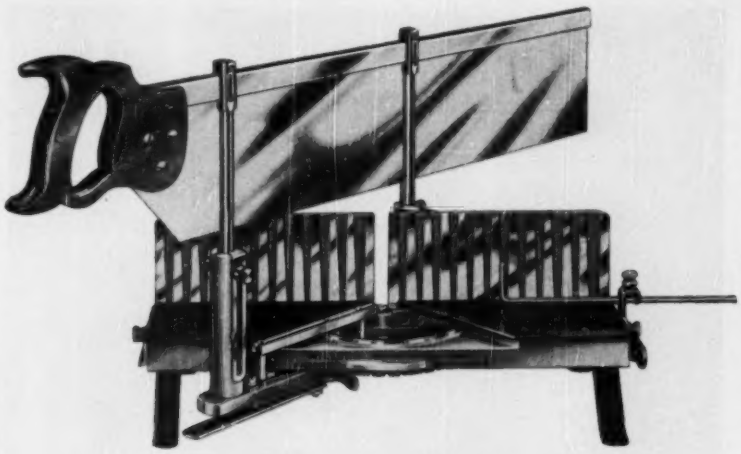
♦ The 37th National Safety Congress and Exposition will be held in Chicago, October 24 through 28, at the Morrison Hotel.

One of the outstanding sessions will be held Thursday morning, October 27, when a panel of students from all over the United States will discuss the value of the driving instruction they have received. Joe Kelly, master of ceremonies for the NBC "Quiz Kids Program," will be the moderator.

Noteworthy also will be the symposium on Thursday morning devoted to the subject, "That They Shall Not Have Died in Vain." The speaker will point out the necessity of training college students for safer living.

♦ Officers for the school year 1949–50, of the New Jersey Section of the A.V.A., are: president, George W. Morgenroth, assistant director, Essex County Vocational Schools, Newark, N. J.; vice-presidents, agriculture: Owen E. Kiser, assistant supervisor, New Jersey State Agricultural College, New Brunswick, N. J.; trade and industry: Harry Lesslie, apprentice co-ordinator, Trenton Public Schools, Trenton, N. J.; home economics: Miss Hilda E. Chilson, supervisor, Passaic Public Schools, Passaic, N. J.; industrial arts: George O'Brien, supervisor of industrial arts, Jersey City Public Schools, Jersey City, N. J.; distributive education: John Barbour, instructor, Middlesex County Vocational Schools, New Brunswick, N. J.; life memberships: Dr. Clarence E. Partch, dean, School of Education, Rutgers University, New Brunswick, N. J.; secretary, John Bambara, instructor, Essex County Vocational and Technical High School, Bloomfield, N. J.; treasurer, Charles A. Haas, assistant director, Middlesex County Vocational Schools, Perth Amboy, N. J.; adviser: John A. McCarthy, assistant commissioner of education, Trenton, N. J.

♦ Officers for the school year 1949–50 for the Southern Regional Trade and Industrial Educational Association are: president, F. O. Woodard, supervisor of trade and industrial education (for Negroes) for the state of Mississippi; secretary, S. C. Smith, assistant state supervisor for trade and industrial education for North Carolina; and treasurer, E. M. Adams, South Carolina industrial education teacher-trainer.



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The bed and back have been redesigned for additional sturdiness. The saw carriage, posts and saw guides are now made of steel. Each saw guide has three "Oilite" bearings providing smoother saw action. Many other tested refinements have also been incorporated to insure continuing accuracy, dependability and ease of operation.

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Questions and Answers

FINISH FOR WOOD BOWLS, TUMBLERS, AND GOBLETS

1140. Q.: I am seeking information concerning the most water and alcohol resistant finishes for wood. To date, DuPont's Penetrating Wood Finish is the material I have found best fitted to meet the finish requirements of wooden salad bowls. To this line of salad bowls I should like to add one of wooden tumblers and goblets, if I can locate a satisfactorily transparent and water and alcohol resistant finish — a finish that is suited to the normal equipment of a small woodworking shop. — *P. L. W.*

A.: With regard to suitable finishes for goblets and wooden tumblers, the following ideas will be of direct value to you.

DuPont Series — It has been my continued experience that where DuPont Penetrating Wood Finish (primarily designed for use on floors), is used for coatings on turned wooden wares that the results have been both beautiful and very practical. You have made no mention of the wood types which are being used for this work, but in case oak, mahogany, or walnut open-pored species are being turned, then a filler base must be mixed with the penetrating wood finish in order to level the pores before final coating and subsequent polishing. Hence:

a) Sand for finish with 4/0 or 6/0 garnet papers;

b) Stain as desired with nongrain raising stain. Let dry four hours;

c) Apply a coat of clear penetrating wood finish carrying 6 to 8 lb. of colored to match silex filler base reduced with turpentine one part and gasoline two parts. Let set until the thinner gloss has left; then rag in while the lathe is in slow motion (300 r.p.m.), being careful to avoid much pressure on the rag, or the wood will be cut below the stain. Let dry overnight; then lightly apply a clear coat of finish as quickly as possible. Let dry overnight.

d) Put on lathe, run slowly and apply a rag strip to lightly rub down the coating to a smooth gloss. Apply a second light clear coat of finish and dry 48 hours.

e) Run in the lathe, apply 2/0 steel wool pad loaded with hard floor wax, and smooth up as desired watching out for over padding and cutting through. Let cool off at high speed for a minute or two; then apply a sheepskin pad, wool side out, to the running job for the final polish. This is very durable and beautiful in the hands of a skilled operator who has learned how to run his work in the lathe without burning or scoring.

Lacquer Series — Follow (*a*) and (*b*) as in the DuPont Series. Follow (*c*) also.

c) Apply a light and even spray coat of standard wood lacquer sealer reduced 50–50 with the correct thinner for the sealer. Dry hard. Sand 6/0.

d) Dust off and spray coat with an even application of wood lacquer, polishing type, reduced 50–50 with the proper thinner. Dry hard and sand with 6/0 garnet finishing paper slightly moistened on the paper back to prevent scratching or scoring.

e) Repeat (*d*). Dry overnight and then polish with 2/0 steel wool and floor wax pad while in the lathe at 600 r.p.m. Finish off with sheep wool pad at 3600 r.p.m.

Either of these types will be splendid, the choice depending on the time and equipment available. I suggest that both be tried out thoroughly so that a basis of sound judgment can be established. — *Ralph G. Waring.*

News Notes

♦ JOHN CLAUDE, formerly with The Bruce Publishing Co., Milwaukee, Wis., has organized a firm of his own under the name John Claude and Associates, Analysts, P. O. Box 1441, Milwaukee 1, Wis.

This organization of consultants and specialists in industrial arts and trade and industrial education offer help in the following educational areas: community occupational surveys, school shop surveys, organization of instructional programs, school shop publicity and promotion, school shop planning and layout, tests and measurements, teacher training, evaluation of shop teacher ability and accomplishment, organization of adult education classes, training within industry, and industrial and public relations.

♦ The present enrollment of 962 students is the largest in the history of The Stout Institute. Of this total, 633 are men, 329 are women.

Late registrations may eventually bring the total enrollment to 5 per cent over that of last year's record 930. Veteran enrollment will be only slightly under the 458 figure for last year, a decrease caused by a high percentage of non-veteran freshmen.

The fact that more freshmen women are enrolled than ever before in the history of the college is attributed to the strong demand for home-economics graduates.

♦ Allied Radio Corporation of Chicago announces the release of a new 1950 catalog containing comprehensive listings of radio and electronic parts and equipment for classroom, laboratory, and shop. A large 196-page publication, it is one of the most complete catalogs of its kind. Special emphasis has been placed on the selection of books, materials, training kits, test instruments, parts, and equipment required by schools for their radio and electronics training activities.

The 1950 catalog will be sent without charge upon request to Allied Radio Corp., 833 West Jackson Blvd., Chicago 7, Ill.

♦ The following German educators visited at Wayne University, Detroit, Mich., during the week of May 8, 1949: Wilhelm Gronan, Berlin; Hermann Miller, Obervellmar Kassel, Hollandische; Dr. Hermann von Braunbehrens, Regensburg, Bavaria; Paul Goller, Berlin School 11, Nuernberg, Bavaria; Leonhard Heimerer, Munich; Dr. Christian Gaessler, Gewerbeschule, Mannheim.

On Friday evening, May 13, these men were entertained at the Wayne University Student Center by the Mu Sigma Pi Fraternity. The formal part of the program consisted of a talk by Andrew Althouse on the auto-mechanics curriculum which has been developed by the A.V.A. automotive conference. Henry Sonsmith, teacher trainer at Wayne University and the University of Michigan, talked on vocational teacher education. Arthur Elges made a short presentation on the plan used at Wayne University to provide supervised work experience for industrial education teachers. G. Manson Taylor explained the industrial-arts special education curriculum. E. H. Curry explained the industrial-arts curriculum. Fred Lutz of the training department, Chrysler Corporation, discussed the plan that is maintained by his corporation to provide work experience for in-service industrial education teachers.

After these presentations a number of exhibits were on display showing typical work done in the department of industrial education at Wayne University. The following graduate students had their theses on display: J. W. Weeks, Hartley Schaal, Adrian Pollock, Robert Swearingen, Walter Kizel, James Cotter, Carlyle Alldread, Clifford

(Continued on page 26A)

KESTER the Greatest Name in Solder!

THERE is a reason for Kester's tremendous success in the industrial field. A staff of highly-trained technical engineers and a half-century of Kester "know how" are teamed to produce the finest flux-core solders made.

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A complete analysis of the application and properties of soft solder alloys and soldering fluxes.

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NEWS NOTES

(Continued from page 25A)

Baker, and Emil Traum. Stig Ralstrom served as co-ordinator of this project.

The following instructors at Wayne University prepared splendid exhibits of curriculum materials and work being done in their classes: Mr. Emig — industrial education, woodworking, patternmaking, and cabinetmaking; Mr. Doliber — industrial education, machine shop; Mr. Pozzini — industrial education, model yacht building; Mr. Wright — industrial education, architectural drawing; Mr. Geck — industrial education, leatherworking; and Mr. Fraser — industrial education, teaching aids and devices.

George McWatt collected a number of courses of study which have been developed by graduate students at Wayne University and had them on display.

James Dotseth, supervisor of trade and industrial education for the state board of control for vocational education, traveled with these men during the week and helped them get an overview of vocational and technical education in the Detroit area.

♦ During the late war, the Sheffield Corporation, Dayton 1, Ohio, published a number of sets of classroom charts entitled "Dimensional Control, Theory and Industrial Application," bound in a rigid easel cover to aid in teaching wartime inspectors the importance of mechanical gauging equipment and how to use it. An accompanying 24-page booklet contains the instructor's teaching outline. There are 46 charts in the set, 28 by 32½ in., all fully illustrated. The set in its carton weighs 16½ pounds and costs more than $15 each to produce at that time and in quantity.

There are a few of these sets left which the Sheffield Corporation will send gratis to those teachers or schools which apply before the supply is exhausted.

♦ A course in industrial arts for the boys of the seventh and eighth grades of the Lockport, Ill., school system is being organized at this time. The course will include instruction in drawing, metalwork, woodwork, wood turning, photography, and leathercraft.

♦ The title, "Frank Wiggins Trade School" was changed to "Los Angeles Trade-Technical Junior College" on September 1 of this year.

♦ A bronze plaque honoring the state of California for progress in the instruction of safe driving in the state's high schools during the past year was presented to Governor Earl Warren on September 27, 1949. The plaque represents the "Superior Award" of the annual Driver Education Award Program sponsored by the Association of Casualty and Surety Companies.

♦ The Association of Casualty & Surety Companies, 60 John St., New York 7, N. Y., presented Governor Roy J. Turner with a bronze plaque honoring the state of Oklahoma for progress in the instruction of safe driving in the state's high shhools during the past year, on September 21, 1949. The plaque represents the Meritorious Award given for maintaining adequate driver training courses in more than one fourth of the state's secondary schools, with more than one fourth of all eligible students enrolled.

♦ A new 32-page Teaching Aids Catalogue, which describes more than 80 charts, posters, booklets, and other materials available to high school teachers, has been released by the School Service Department of the Westinghouse Electric Corporation.

Materials described in the catalog can be obtained free of charge or for a nominal sum. Each catalog contains order blanks for use in requesting materials.

Teachers can secure copies of this 1949-50 Teaching Aids Catalogue (B-4560) through the School Service Department, Westinghouse Electric Corp., 306 Fourth Ave., Box 1017, Pittsburgh 30, Pa.

♦ Practical information about types of heating units and how they can be applied to specific farm operations is contained in a 10-page booklet, "How to Apply Electric Heating on the Farm," recently released by the Westinghouse Electric Corporation.

For a copy of B-4156, write Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa.

♦ A new revision of "Man and the Motor Car," pioneer textbook for high school driver education courses, was announced recently by the Accident Prevention Department of the Association of Casualty and Surety Companies, 60 John St., New York 7, N. Y.

With its accompanying manuals and teaching materials, "Man and the Motor Car" forms the basis of most of the safe driver education courses in high schools throughout the country.

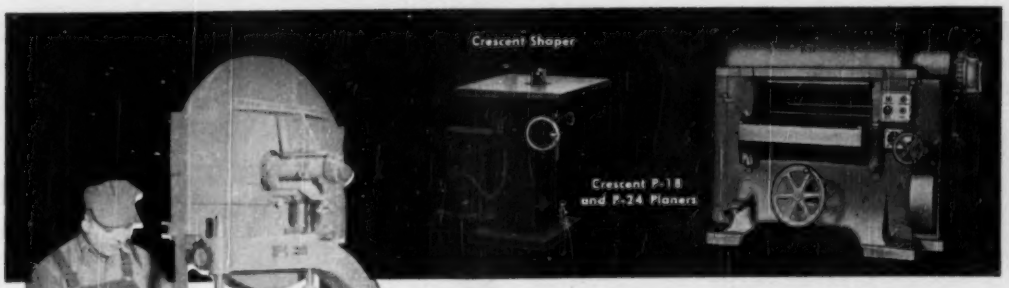
♦ The new $1,025,000 W. Harrison Hightower Textile Building, with its almost $1,000,000 worth of equipment, will be opened at Georgia Tech, October 14 when the A. French Textile School celebrates its fiftieth anniversary. The building was made possible through a state $850,000 grant and an appropriation of $175,000 by Board of Regents. Equipment was purchased from funds allocated by the Textile Education Foundation.

♦ The opening of enrollments in the 1950 competition of the Fisher Body Craftsman's Guild in which $65,000 in university scholarships and other awards are offered youths throughout the nation who design and build the best model automobiles has just been announced.

A booklet on model car design and construction will be sent to each boy enrolling in the Guild. This book was prepared by professional designers from the General Motors Styling Section, Fisher Body Division engineers, and the Technical Staff of the Craftsman's Guild.

The design manual shows how to sketch a

(Continued on page 28A)



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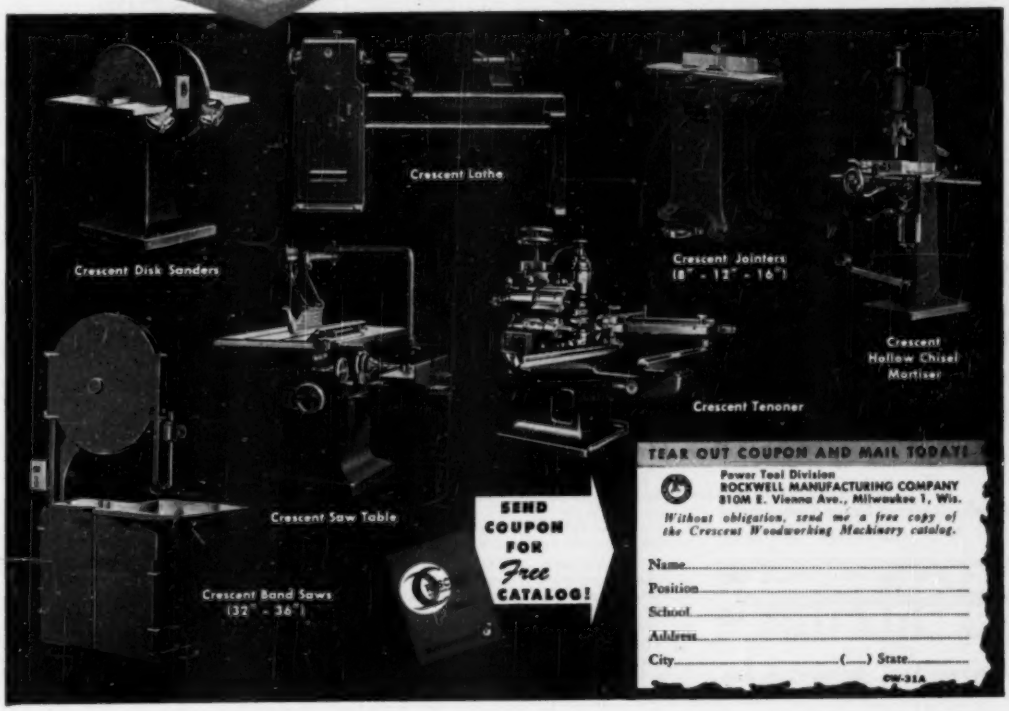
Students trained on Crescent Woodworking Machines are "right at home" in industry; their performance is a credit to you. For more than 50 years, woodworking plants everywhere have been Crescent-equipped.

Your nearby Crescent distributor can supply Crescent Woodworking Machinery on easy deferred payments that suit your budget. Ask him for complete details.



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NEWS NOTES

(Continued from page 26A)

model car, including some of the practical limitations that face the professionals. It also illustrates, step by step, how to build the model either by casting it in plaster of Paris or by carving it from a wood block.

The awards for the best models entered in the Guild competition again include eight university scholarships for the national winners of the Junior (12 through 15 years old) and Senior (16 through 19) Divisions of the competition. In each age group the awards will be: First — $4,000 scholarship; Second — $3,000; Third — $2,000; Fourth — $1,000.

There will be 14 awards in each state and the District of Columbia, seven in each age division as follows: First — $150 cash; Second — $100; Third — $50; and four Honorable Mention awards of Model Builder's Tool Chests. For judging purposes, the states and District of Columbia will be grouped into 20 regions, each of which will send a junior and senior division winner expense-free to the national Guild Convention in Detroit next August.

Deadline for finishing model cars is midnight July 1, 1950. Guild representatives now are visiting schools throughout the country, presenting the Guild program to student assemblies and taking enrollments.

Youths desiring to enroll in the Craftsman's Guild who have not already signed up for the 1950 competition may do so by writing a letter or postcard to the Fisher Body Craftsman's Guild, General Motors Building, Detroit 2, Mich.

♦ A new, up-to-date edition of the booklet, "National Apprenticeship Standards for Carpentry Apprenticeship," has been made available by the Bureau of Apprenticeship, U. S. Department of Labor. The standards were formulated with this bureau's assistance by the National Joint Carpentry Apprenticeship Committee, equally representative of the Associated General Contractors of America and the United Brotherhood of Carpenters and Joiners of America.

The booklet contains two parts, the first part outlining the provisions of the national standards and the second part explaining in detail how these standards may be adapted locally by employer and labor groups in establishing programs and organizing local apprenticeship committees.

Copies of this booklet may be obtained free of charge by writing to the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C. When requesting copies, please mention the publication in which this announcement appeared.

♦ "Craft Training Yesterday and Today," may be obtained free of charge by writing to the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C. When requesting copies, please mention Industrial Arts and Vocational Education.

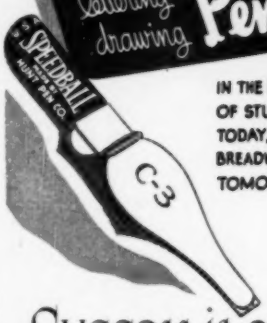
This reprint from the American Vocational Journal presents the development of apprenticeship in the United States since Colonial days. It contrasts the early indentures with today's apprenticeship agreement, which is the modern version of the original indentures, and traces apprentice training methods and practices prior to and following the industrial revolution, and since the enactment of the national apprenticeship law in 1937.

Described, also, are the experiences of Benjamin Franklin as an apprentice in 1718.

♦ "Heat Transfer," Vol. 1, by Dr. Max Jakob, research professor of mechanical engineering at Illinois Institute of Technology and foremost international authority on heat transfer, has been published by John Wiley & Sons, New York.

The book is devoted mainly to the fundamentals of heat transfer. It is a treatise for research workers and a textbook for graduate and intermediate teaching.

Speedball lettering-drawing Pens



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First Prize, Lettering, Senior High School.....By Joyce Gulleson, Thomas Carr Howe High School, Indianapolis, Ind. First shown at The Wm. H. Block Co., Indianapolis.

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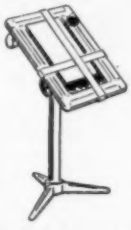

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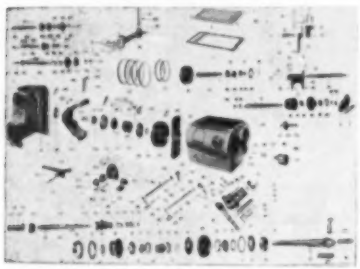
Shop Equipment News

NEW PRODUCTS — PUBLICATIONS

NEW EXPLODED PARTS LATHE MANUAL ANNOUNCED BY LeBLOND

A 28-page lathe instruction manual using the new exploded parts photo technique has just been completed by The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. Every unit of the LeBlond Dual Drive lathe, from headstock to tailstock, is completely exploded with all parts numbered in the order of disassembly and shown in size and relation to adjacent parts.



Exploded parts illustration from R. K. LeBlond Machine Tool Co. manual

The new book contains over a dozen exploded parts photos and illustrates over 740 parts. Shown here is the Dual Drive combination gear-belt drive headstock which consists of 226 separate parts.

Many cutaway and cross section views, diagrams and photos are also employed. Illustrations are accompanied by text so that every phase of Dual Drive design, construction, operation, and maintenance is completely and carefully described.

It is believed the new LeBlond exploded parts lathe manual will be of great value to the machine-shop instructor, and it is being offered free, one copy to an instructor when requested on school letterhead. Additional copies for classroom study may be purchased at 50 cents each.

For brief reference use IAVE—1101.

BRODHEAD-GARRETT CO. 1949–50 CATALOG

The annual edition of the Brodhead-Garrett Co., 4560 E. 71 St., Cleveland, Ohio, is off the press.

It is needless to tell school shopmen that this 280-page catalog contains information on thousands of items which they need in their shops.

Get your copy.

For brief reference use IAVE—1102.

HB8 HINGE BUTT ROUTER

Stanley Electric Tools, New Britain, Conn., announces the new powerful and efficient ½-h.p. Stanley-Carter hinge butt router.

½ H.P. Stanley-Carter hinge butt router

The HB8 features new style aluminum subbase with anodized surface that minimizes wear and prevents discoloring the work surface. It is equipped with ball bearings that are sealed and lubricated for life. The motor has an extra large shaft, built to withstand vibration and mechanical shock, and the collet type chuck grips without slipping. An oversize ventilation system keeps the motor cool and surfaces clean.

For brief reference use IAVE—1103.

THREE NEW ITEMS FROM THE L. S. STARRETT CO.

To aid inspectors, machinists, mechanics, tool

(Continued on page 32A)

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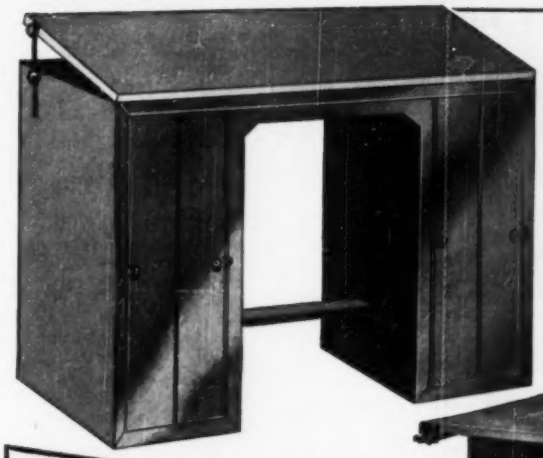
On These TWO B-G Exclusives That Are Winning High Praise Everywhere



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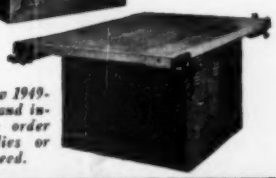

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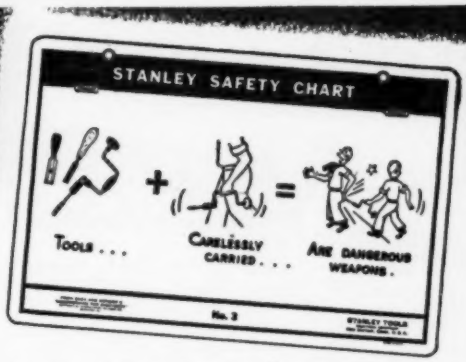
NEW! STANLEY SAFETY CHARTS



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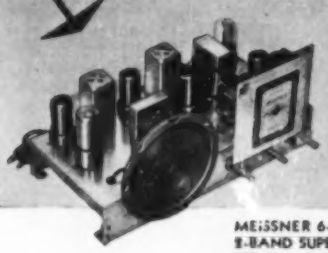

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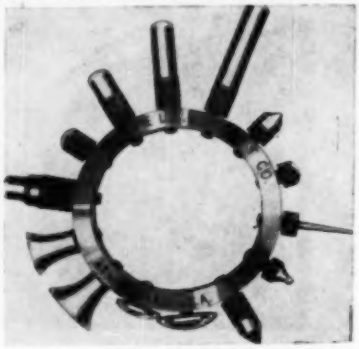
SHOP EQUIPMENT NEWS

(Continued from page 30A)

engineers, and others who make frequent use of dial gauges, The L. S. Starrett Co., Athol, Mass., has perfected a new Starrett dial indicator point selector which provides a complete selection of 14 frequently used interchangeable contacts in a convenient "package" that makes selection and safe keeping easy. The selection includes 14 standard and special points all of which have a 4-48 mounting thread to fit any standard American gauge design indicator. The points are securely mounted in tapped holes on an attractive, lightweight aluminum ring with each contact identified by size or number stamped on the ring. The choice includes a range of four standard 13/64-in. dia. points, ¼ in., ½ in., ¾ in., and 1 in. long; 9 special shapes for measuring in holes or restricted places or for gauging on small, resilient, or rough surfaces; and a shock absorbing point with an internal spring and telescoping anvil which protect the indicator from sudden



Dial indicator-point selector

shock or blows. The points are precision made from high grade steel, hardened, ground, and chrome plated.

The L. S. Starrett Company also announces the purchase of the Burrill Saw and Tool Works of Ilion, N. Y., manufacturers of Paramount Band Knives and Band Saws. These products are now being manufactured exclusively by The L. S. Starrett Company in their Athol plant and are being marketed under the Starrett name through Starrett distributors.

The Burrill items which include band knives for cutting paper, textiles, rubber, bread, cake, boneless meat, etc., and band saws for wood, metals, dry ice, fiber, meat, bone, plastics, etc., have been sold nationally under the trade name "Paramount." Added to the Starrett lines, they enable The L. S. Starrett Company to meet all requirements for precision cutting.

The Starrett Precision Tools catalog may be obtained by writing to the firm. It describes tools that are used in automotive, aviation, marine maintenance, and farm workshops.

For brief reference use IAVE—1104.

NEW WALKER-TURNER CATALOG

A new 16-page catalog has recently been published by the Walker-Turner Division, Kearney & Trecker Corp., Plainfield, N. J., which illustrates the line of smaller tools made by this company. Four brand new models, catalogued for the first time—a 12-in. band saw, 6-in. jointer, 8-in. tilting table saw, and a 9-in. tilting arbor saw are included in the index of nine machines illustrated.

MONARCH TOOL CO. CATALOG

The Monarch Machine Tool Co., Sidney, Ohio, has prepared a 22-page catalog on their precision toolmakers and production lathes available.

The catalog also describes automatic sizing lathes, automatic cycle lathes, and engravers.

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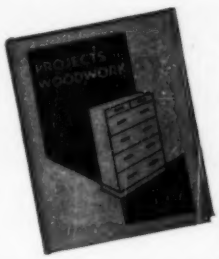

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New Publications

Fundamentals of Soft Soldering

By Charles Yerkow. Cloth, 95 pp., 5¾ by 7¾ in., illus., $2.25. The Manual Arts Press, Peoria 3, Ill.

The author of this book has had personal experience in training industrial workers in soft soldering on metals of different kinds.

The instruction is very specific, and the insistance on constantly observing the factors of cleanliness, proper solders and fluxes, using the proper tools in the right manner, and using the proper heat for the job, cannot but impress the beginner that to do good soldering, one must know the techniques and acquire the simple skills which the book outlines in such a manner that it can be used for self-instruction or as a part of an existing course in sheet-metal work.

Family Housing

By Deane G. Carter and Keith H. Hinchcliff. Cloth, 265 pp., 5¾ by 8½ in., illus., $4. John Wiley and Sons, Inc., New York City.

Housing and house planning as they relate to family living are the subject matter of the present volume. It has been written as a textbook for college students and as a reference for home economists, teachers, and other persons who have a personal or professional interest in housing the family. The authors describe the purpose of the book as being the development of an understanding and an awareness of housing problems and the provision of the information needed for their solution.

Topics discussed include public problems of housing, resources for planning, approach to house planning, kitchen and workroom, living and sleeping areas, general planning problems, planning for remodeling, farm houses, planning home equipment, protective qualities, basic measurements, house structure, choosing materials, costs and material quantities, economic and financing problems, acquiring home ownership. References for housing study are given.

Welding Metallurgy

By O. H. Henry and G. E. Claussen. Revised by G. E. Linnert. Cloth, 505 pp., 5¾ by 7¾ in., illus., $2.50. American Welding Society, 33 West 39th St., New York, N. Y.

This is the second edition of this very complete book the aim of which from its very beginning, was not only to explain the welding of steel and ferrous alloys, but also to show the interrelation between metallurgy and welding.

The book is divided into 15 chapters which treat the subject matter under the following headings: Metallurgy of Welding; Types of Steel and Their Manufacture; Welding Methods and Processes; Temperature Changes in Welding; The Structure of Metals; The Mechanical Properties of Metals; Effects of Alloying Elements; Fluxes and Slags; Simple Welds in Iron and Steel; Shrinkage in Welds; Preheating and Postheat Treatment; Difficulties and Effects; Welding Plain-Carbon and Low-Alloy Steels; Welding Stainless and Heat-Resisting Steels; and Welding Tests.

There also is an appendix which gives the physical properties of metals, a glossary of terms, a list of questions and problems based on the subject matter treated in the various chapters, and a list of abbreviations and chemical symbols.

Scientific Glass Blowing and Laboratory Techniques

By W. E. Barr and Victor J. Anhorn. Cloth, 388 pp., 4⅝ by 8 in., illus., $6. Instruments Publishing Co., Inc., 1117 Wolfendale St., Pittsburgh, Pa.

(Continued on page 36A)

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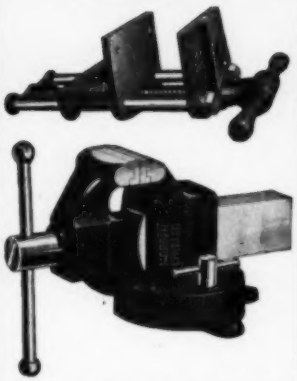

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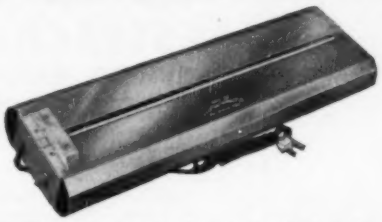

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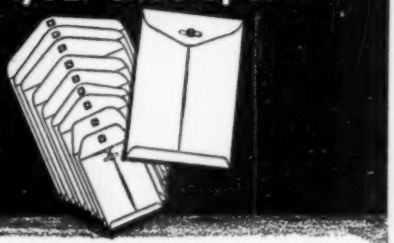

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NEW PUBLICATIONS

(Continued from page 34A)

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Technical Sketching and Visualization for Engineers

By Hyman H. Katz. Cloth, 163 pp., 7¾ by 10¼ in., illus., $5. The Macmillan Co., 60 Fifth Ave., New York City.

A well-illustrated text showing how technical sketching can be and is used in industry. The beginner in drawing can feel sure that if he applies the instruction given in this book, he can become quite adept at sketching even if he feels that he has no aptitude for drawing at all.

The text treats the subject under the following chapter headings: Technical Sketches; Straight Lines; Curved Lines; Proportion; Lettering, Symbols, Practice, Problems; Orthographic Sketching; Pictorial Sketching; Shading; Measurements from the Model; and Non-Graphical Visualization.

How You Look and Dress

By Byrta Carson. Cloth, 394 pp., 5¾ by 8¼ in., illus., $2.40. McGraw-Hill Book Co., New York City.

A good text for a first course in clothing. The author treats the subject under the following chapter headings: Your Grooming, Care of Your Clothes, The Design of Your Clothes, The Color of Your Clothes, The Textiles of Your Clothes, The Right Clothes for You, Buying Your Clothes, Selecting Your Sewing Equipment, Using the Sewing Machine, Sewing by Hand, Taking Measurements and Altering Patterns, Getting Material Ready, Cutting and Fitting, Making a Skirt, Making a Blouse, Making a Dress, and Remodeling Your Clothes.

Occupational Pamphlets

By Gertrude Forrester. Cloth, 354 pp., 6 by 9¼ in., $2.50. H. W. Wilson Co., New York City.

This is a revised and enlarged edition of a listing of job descriptions, and other pamphlets about occupations.

It may be used as a comprehensive list of source materials by vocational counselors, and others who have to do with the guidance of adolescents.

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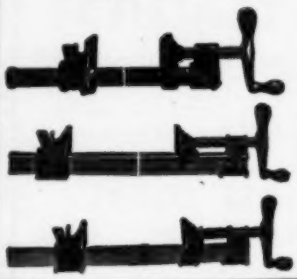

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A Tribute to Louis M. Roehl

BACK in 1913, when Louis M. Roehl was a modest teacher at the Milwaukee County School of Agriculture, he brought into the offices of *Industrial Arts and Vocational Education* his first simple projects on agricultural woodworking. He couldn't understand why a country boy should make necktie holders or the things that mainly interest the city boy. Why weren't chicken feeders or hay racks more logical and proper shop projects for the country boy?

LITTLE did Louis M. Roehl think in the passing of time his basic concept of an outstanding professional service for manual training on the farm would develop into our great American farm shop program.

CORNELL University caught the magnificent contribution that Mr. Roehl was making in that early pioneer period and obtained his services as an instructor as early as 1917. He was soon promoted to an Assistant Professorship and then given a full time chair as Professor of Farm Mechanics at Ithaca.

FOR OVER 30 years Louis M. Roehl has defined and developed his concept of a well-rounded farm shop program. He has trained thousands of teachers. His FARMERS' SHOP BOOK, always kept current, has been the leading text in its field for nearly 25 years and still holds this position. In addition to his outstanding work at Cornell, he established (during a year's sabbatical leave) farm shop work in a famous school in England and at other times conducted special teacher training courses in farm shop work in over a dozen universities from Maine to California.

IN JUNE, 1949, the faculty and students of Cornell University tendered a farewell party to Louis M. Roehl. In proper dignity and respect they paid tribute to the lifetime of a modestly grand pioneer who made such a great professional contribution to the needs of farm mechanics in rural America. In the march of time, Mr. Roehl's idea had been accepted by the American people and Louis M. Roehl was, in reality, attending his own graduation.

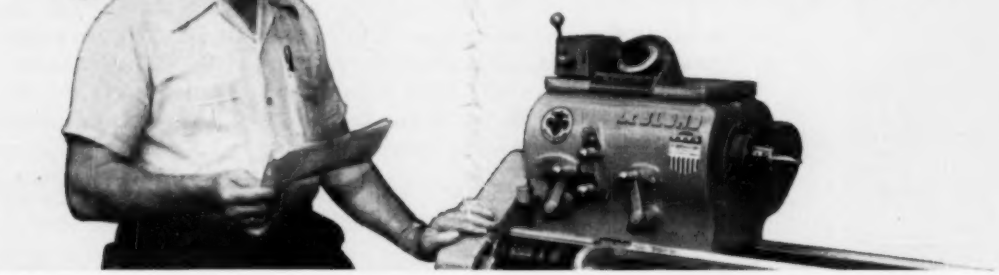
IT IS with great pride that we make this public testimonial to a grand teacher, a splendid philosopher of education, and a humble educator who has done so much to give us a professional concept of the farm shop.

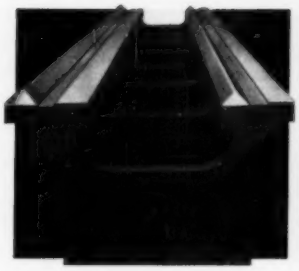
FRANK BRUCE

"turning tips for trainees"

BY OLD-TIMER FRED STUTZMAN, 37 YEARS AT LeBLOND

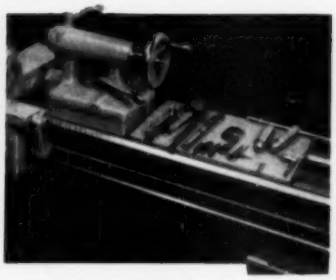
I've got a pet theory that I can pretty well size up the lathe operator with just a quick look at the bed and carriage of the lathe he runs. Here's an idea or two on how to take care of your lathe.





THE BED LOOKS LIKE THIS when it leaves our plant – accurately scraped and polished. If the operator uses it for an anvil to drive mandrels in and out, or . . .

IF HE USES IT AS A RACK for hammers, wrenches and chucks, it won't be long before he pounds out the accuracy or feeds the carriage against an obstacle lying on the bed.



THE SMART OPERATOR has a board at the tailstock end for his tools. He keeps the bed free of chips and wipes the shears clean with oil. Easy things to remember, and mighty important.

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